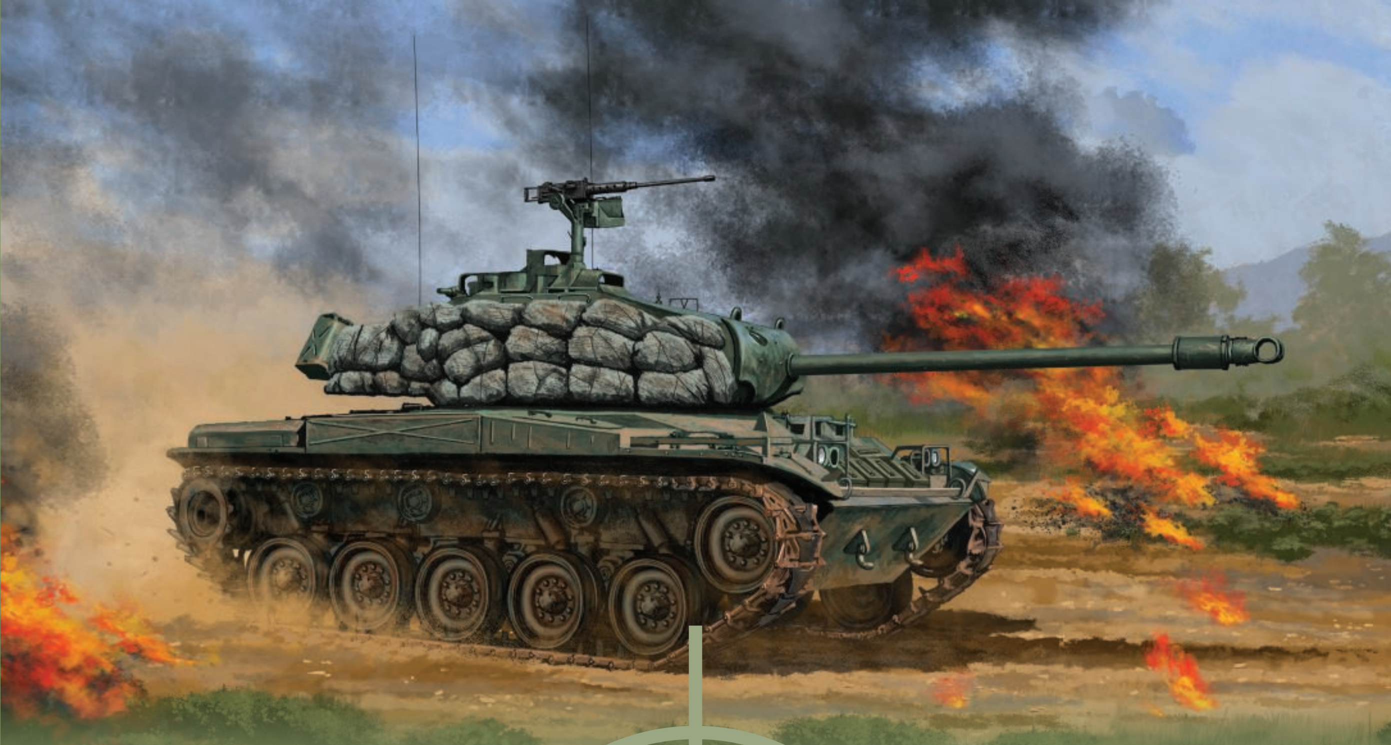
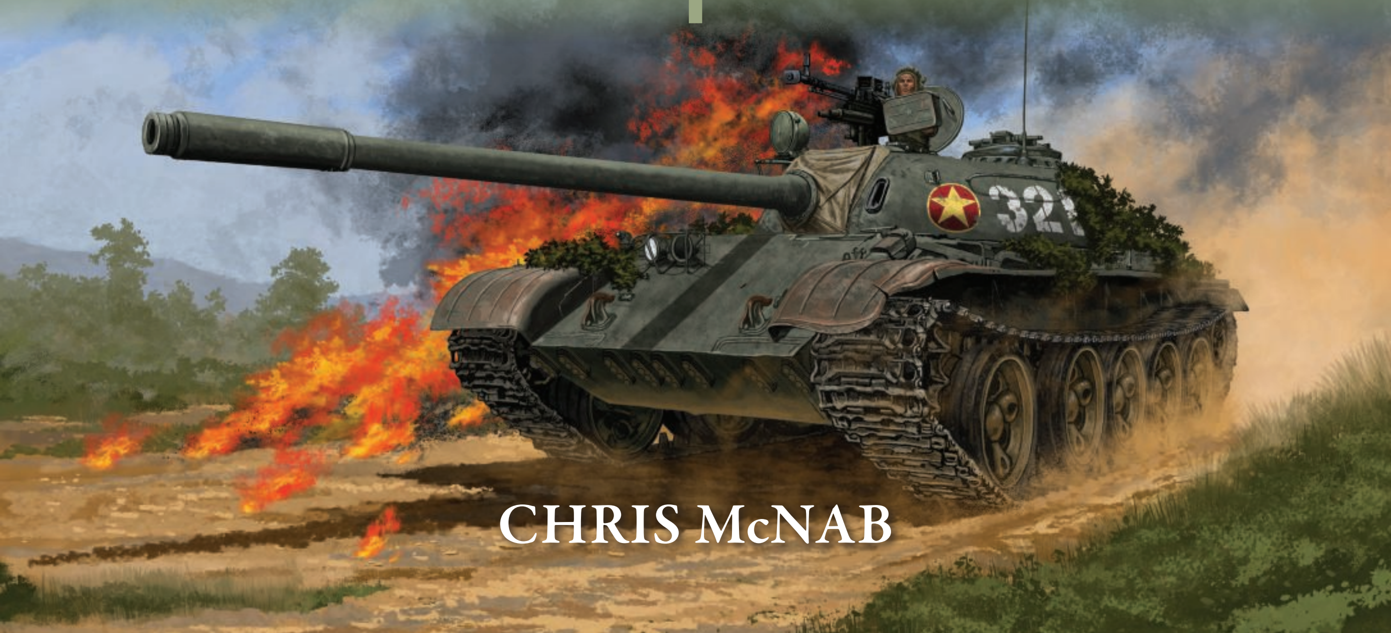


WALKER BULLDOG VS T-54

Laos and Vietnam 1971–75



CHRIS McNAB

WALKER BULLDOG VS T-54

Laos and Vietnam 1971–75

CHRIS McNAB

CONTENTS

Introduction 4

Chronology 8

Design and Development 10

Technical Specifications 24

The Strategic Situation 36

The Combatants 42

Combat 55

Statistics and Analysis 72

Aftermath 76

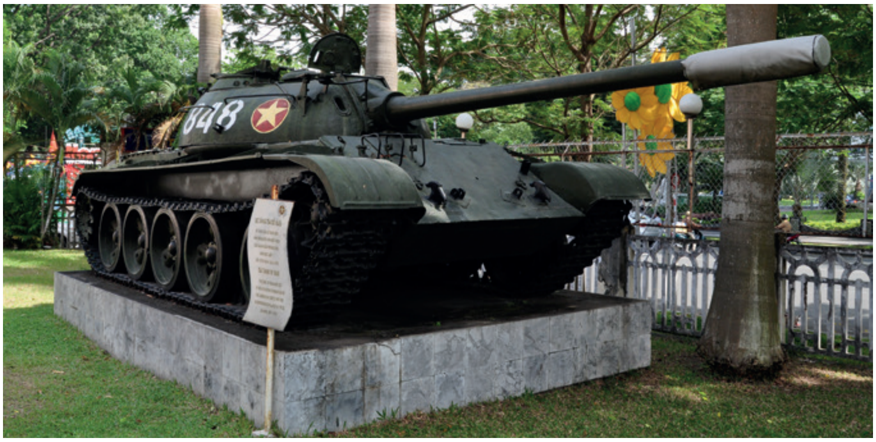
Bibliography 79

Index 80

INTRODUCTION

The Vietnam War is not popularly associated with armored warfare, especially tank vs. tank actions. The familiar depictions of the conflict, especially in Western representations, lean instead toward guerrilla-style insurgency and foot-slogging search-and-destroy missions, accentuated by the mass application of air mobility and close air support. Urban warfare also showed its face during the periods of large-scale North Vietnamese offensives, such as the grim battle for Hue in 1968 during the Tet Offensive, and the multiple town and city battles during the Easter Offensive of 1972. Armor was present, but could appear to be peripheral.

In fact, the application of armor in Vietnam was both significant and widespread, especially during the 1971–75 period examined here, when the North Vietnamese ground forces, known as the People's Army of Vietnam (PAVN), reached the peak of



This T-54B, preserved at the Museum of the Ho Chi Minh Campaign in Ho Chi Minh City, served in the 203d Armored Regiment and was in the vanguard of tanks entering the grounds of the Presidential Palace in Saigon at 1030hrs on April 30, 1975. (Happy Midnight/ Wikimedia/CC BY-SA 3.0)

The dead body of an ARVN soldier is laid on the front of an M41A3 on the streets of South Vietnam. The photograph is not dated, but is likely to be either 1972 or 1975. Note how the muzzle of the .50-caliber M2 HB machine gun is fitted with a wide flash hider, to reduce the muzzle flash visibility to the enemy and lessen blinding flash effects for the operator. (Bettmann/Getty Images)

its armored strength – courtesy of an increase in Soviet and Chinese imports – and locked horns with the tanks and armored personnel carriers (APCs) of the US-backed South's Army of the Republic of Vietnam (ARVN). What we look at in this study, to a limited degree, are *large-scale* tank vs. tank engagements over open terrain, decided largely by the mass of tanks, gunnery, and mobility of opposing armor. Yet as will become evident, from 1968 onward tanks became more and more key to the outcome of battles in the Vietnam War, as what had largely been an insurgency campaign moved to conventional warfare.

In this study, the armored war is viewed through a very specific prism – that of clashes between the US-supplied, ARVN-operated M41A3 Walker Bulldog light tank and the T-54 and Type 59 (a Chinese licensed copy of the T-54A) main battle tanks (MBTs) deployed by North Vietnam. In some ways the meeting of M41 and T-54 was rather like that between the biblical David and Goliath, the US tank being the smaller but plucky opponent against the heavier, and theoretically more potent, T-54. The M41 was a pure light tank, developed primarily for its speed and mobility, including the possibility of air transportation, but with a gun powerful enough to challenge heavier medium tanks. In many ways, it belonged to the past not the future. Alongside the M551 Sheridan, first fielded in 1969, the M41 was one of the last US-designed light tanks; the future of light armor would belong to more mobile, lighter, and often wheeled infantry fighting vehicles (IFVs) or up-gunned APCs. The T-54, by contrast, was at the spear-tip of a new generation of main battle tanks – clad in thick armor and armed with a long-range tank-killing gun, capable of taking on the heaviest opposing tanks.

On paper, the odds of victory in any battle between these two armored vehicles would appear to have been stacked in favor of the T-54. Yet as this study demonstrates, outcomes could play out very differently in reality: context was key. It is a core doctrine of armored warfare that tanks should rarely, if ever, operate without support from infantry and/or air assets. Armored vehicles are undoubtedly powerful, but their limited hatch-down vision, generally slow pace of maneuver (particularly in complex and challenging terrain), and high visibility – and the presence of a whole spectrum

Looking for photo opportunities during the Tet Offensive, a young photographer (Lo Manh Hung) takes an image with an ARVN M41A3 in the background. One soldier mans the .50-caliber M2 HB machine gun in the commander's hatch while another, likely the tank commander or a higher-level officer, communicates via a large radio set mounted atop the turret. (Bettmann/Getty Images)

of infantry armor-killing weaponry – mean that they remain vulnerable. In Vietnam, for example, the US and ARVN armor had to face the rapid and enormous proliferation of both the RPG-2 and then the infamous RPG-7 man-portable, shoulder-launched antitank weapons, the latter still destroying tanks today, nearly six decades after it entered service with the Soviet Army in 1961. Countering such threats was largely the responsibility of foot-slogging and mechanized infantry forces, not that of the tanks that were threatened.

In the analysis that follows, therefore, the tactical context is central to the outcome of the engagements between these two unequal armored vehicles. This context not only included the aforementioned infantry support, but also close air support (rotary and fixed-wing), terrain, weather, training, morale, supply and logistics, political strategy, and liaison with other forces. This is not to take anything away from the abilities and courage of tank crews, nor the intelligence of commanders, but rather recognize that the result of any battle was almost always the product of multiple factors, not all of them consciously handled but collectively reaching a single conclusion.

Yet within the assessment of context, the capabilities of the individual weapon systems are of course important. The M41 and the T-54 represented somewhat different expressions of armored doctrine. As a light tank, armed with a 76mm gun, the M41 harked back to the tradition of rapid gunnery over the precision kill; light tanks compensate for their reduced firepower with the ability to fire multiple rounds quickly, several strikes leading to the cumulative destruction of the opponent. The T-54, by contrast, belonged to what has been called the "sniper tank" concept, in which a long-range, first-shot, precision kill was paramount, backed by the survivability conferred by formidable armor. The M41's gun, as will become evident, still had a potency sufficient to disable or kill any MBT, but the ARVN tank crews had to rely on more than just gunnery if they were to survive a clash with heavier PAVN armor.

The final element that will emerge with clarity in this book is the human factor. The engagements studied occurred at a uniquely uncertain time in the struggle for Vietnam's future. ARVN armored forces, while well equipped, were having to cope with the progressive draw-down of US support, plus the psychological depredations of systemic corruption, casualties, and declining morale. The PAVN tankers, meanwhile, were part of an army whose goal of victory loomed ever more clearly, but whose strength and resilience were sapped by sustained and dreadful levels of casualties in every engagement. The fighting between ARVN and PAVN forces specifically in Vietnam has often been sidelined in favor of studying the US war. This volume will hopefully serve as a partial corrective to this tendency.

OPPOSITE
A T-54B moves past a PAVN infantryman in Saigon in 1975. Note how the belt of 12.7×108mm cartridges in the turret-mounted DShKM machine gun is not boxed; typically, the ammunition would be in a container. The DShKM machine gun had a maximum range of up to 3,000m. (PHAN KHAC DUONG, PHAN THANK GIAN/AFP/Getty Images)

836

CHRONOLOGY

1944

November In the Soviet Union, the Obiekt 136 then Obiekt 137 programs begin, which would lead to the T-54 tank.

1945

January 1 The first prototype of the T-54 is produced.

November US specifications for a new light tank are issued.

1946

September The T37 Phase I program begins, producing prototypes of what would become the M41.

April 29 The T-54 Model 1946 (T-54-1) is accepted for Soviet Army service.

1951

June Production of the T41E1 begins at the Cleveland Tank Plant.

1952

November The US Army gives approval for the T41E1 and T41E2 to be issued to service units.

1953

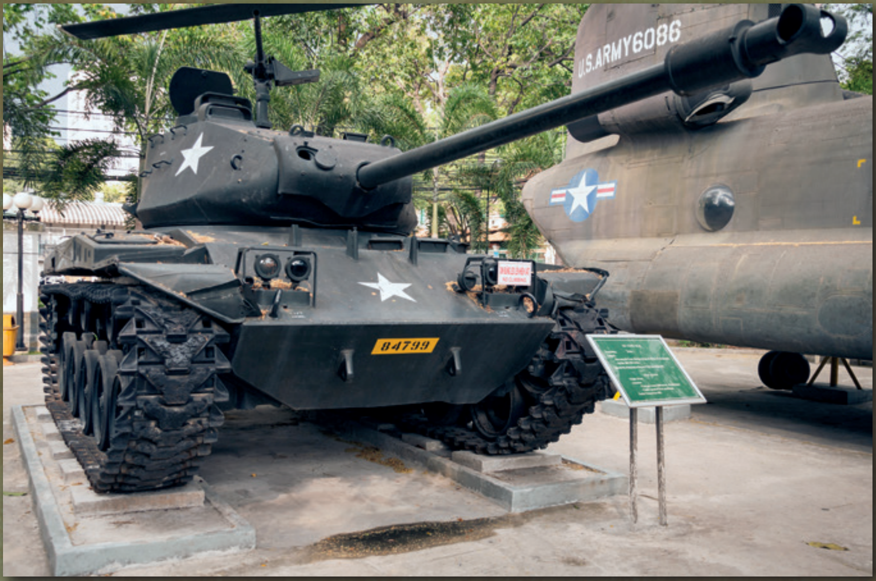
May 29 The T41E1 and the T41E2 are redesignated M41 and M41A1 respectively.

1955

May The introduction of a fuel-injection system into the M41 and M41A1, plus some other changes, produces the M41A2 and the M41A3 respectively.

March 8 The T-54A is accepted into service with the Soviet Army.

April 1 Formation of the South Vietnamese Armor Command.



A wartime M41A3 on display in a military museum in Ho Chi Minh City. Despite the US markings, the M41s were used only by ARVN formations during the Vietnam War, the M41 having become obsolete in US service in the 1950s. (Mel Longhurst/VW Pics/UIG via Getty Images)

1956

March The T-54B is approved for production.

1958

October The Chinese Type 59, a licensed copy of the T-54A, first appears in a Chinese military parade.

1959

October The PAVN establishes its first major armored unit, the 202d Armored Regiment.

1965

January–April The ARVN receives its first batch of 350 US-surplus M41A3s.

March The United States deploys its first combat troops to Vietnam.

1971

February 8 Operation *Lam Son 719* begins.

February 10 The ARVN's 1st Armor Brigade reaches Aloui.

February 25 FSB 31 north of Aloui is overrun by a PAVN armor–infantry force.

February 27 Five M41A3s wipe out multiple PT-76 and T-54 tanks for no losses during an attack on FSB 31.

March 19 The 1st Armor Brigade begins its withdrawal to the South Vietnamese border.

April 6 The 1st Armor Brigade arrives back in South Vietnam, having suffered 60 percent losses.

1972

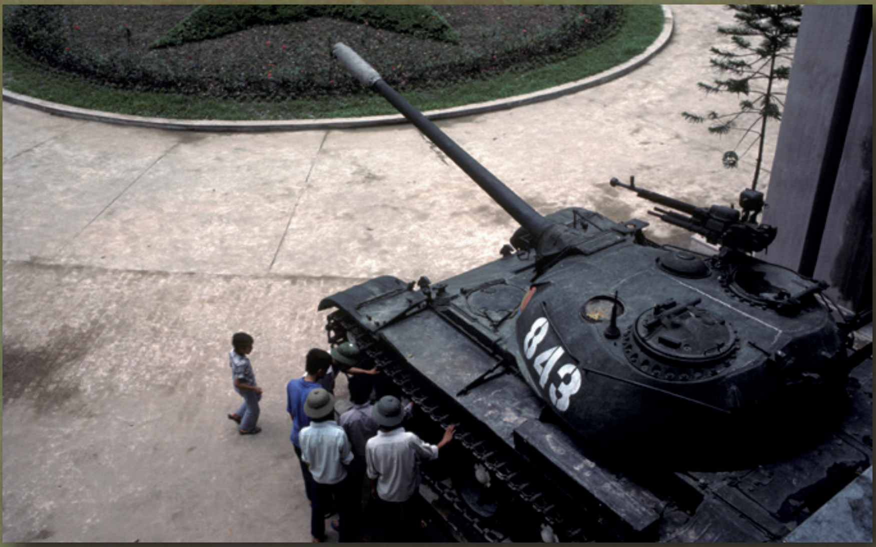
March 30 The PAVN Easter Offensive begins.

April In Military Region I (MR I), M41A3s fight PAVN T-54s in several engagements, typically with heavy ARVN casualties. ARVN M48A3 Pattons account for most of the PAVN tanks destroyed in tank vs. tank engagements. In MR II, M41A3s are unable to prevent Tan Canh and Dak To II falling to armor-supported assaults. In MR III, 12 M41A3s are destroyed by PAVN T-54s and antiarmor teams in a battle around Loc Ninh on April 5.

May In MR I, Quang Tri falls to the communist forces. In MR II, M41A3 units help stop PAVN efforts to take Kontum.

1975

April 30 T-54 tanks break into the grounds of the Presidential Palace in Saigon as South Vietnam falls to a PAVN offensive.



Vietnamese students in the 1980s study a PAVN Type 59 tank (a Chinese copy of the T-54A) that served in the Vietnam War. This top view shows the commander's hatch on the left and the loader's hatch on the right, the loader having responsibility for loading and operating the DShKM machine gun. (Alex Bowie/Getty Images)

DESIGN AND DEVELOPMENT

THE LEGACY OF WORLD WAR II

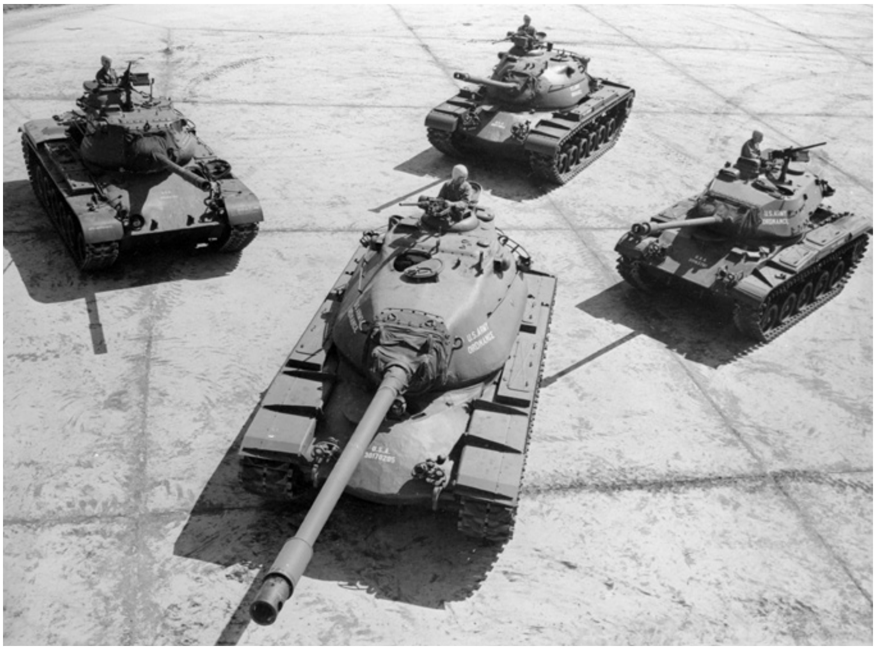
The M41 and the T-54 were both developed under the very specific influences of the late actions of World War II and the subsequent emerging Cold War between the West and the Eastern Bloc. The world war had been a conflict in which three elements took center stage – armor, artillery, and air power. From the armor perspective, the escalating tensions between Washington, DC and Moscow raised the prospect once more of tank vs. tank clashes on the Central European plains, a fact that made the development of new generations of medium and heavy tanks with precision long-range "sniper" gunnery and high survivability imperative. At the same time, the accelerating move toward widespread mechanization and air mobility, combined with the potentially global nature of Cold War proxy conflicts (illustrated by the start of the Korean War in June 1950), meant that there was also a requirement for lighter – and, preferably, air-transportable – armored vehicles, to provide reconnaissance and fire support for fast-moving mechanized infantry.

For the Soviets, armored vehicle development during the 1950s focused upon APCs (BTR-152, BTR-40, BTR-50, and BTR-60), amphibious scout cars (BRDM-1 and BRDM-2) and a formidable new MBT, the T-54, plus its eventual successor, the T-62. In the United States, the emphasis was placed on two new light tanks (M41 and M551 Sheridan), the next generation of 90mm-gun "medium" tanks (the Patton series), the groundwork for a heavier 105mm tank (an armored fighting vehicle that would become the M60 Patton, itself inspired by the US acquisition of a T-54), and a new APC (the M59, plus development of what became the M113 in 1959). The M41 and T-54 occupied different columns in the tables of tactical categorization, and in the expectations of their capabilities. Yet uniting their development somewhat was the recognition that gunnery – in terms of both weapon and fire control – was central if these armored vehicles were to survive on the Cold War battlefields.

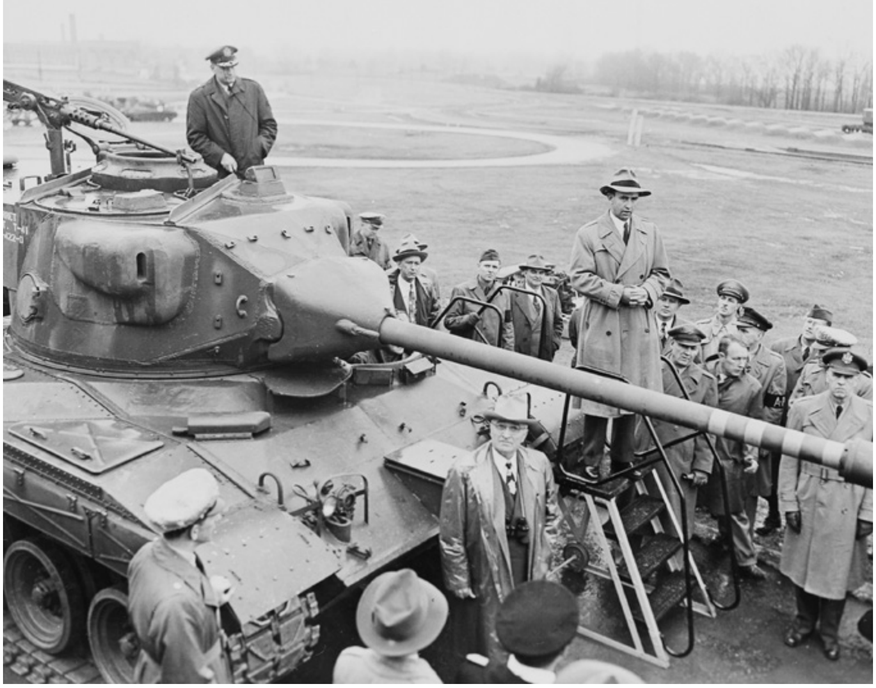
THE M41 WALKER BULLDOG

As World War II approached its end in 1945, senior military planners in the United States began a detailed tactical and technological audit of the US armed forces, viewing the nation's requirements to counter the specific nature of the Soviet threat. The need for a new light tank to replace the wartime M24 Chaffee and the M3/M5 Stuart was a priority, not least because the principal Soviet medium tank at the end of the war – the T-34/85 – had almost the same speed and maneuverability as the Chaffee, but outgunned and out-armored the US vehicle; an imbalance later painfully brought home when the two tanks clashed during the Korean War (1950–53).

The specification for the new light tank was issued by the collective efforts of the Army Ground Forces Equipment Review Board and the War Department Equipment Review Board in November 1945. The basic requirements were that it was to weigh about 25 short tons (roughly 22,700kg) and have similar mobility to the Chaffee, but it should possess more capable firepower and improved armor protection, such that it could hold its own on the battlefield against heavier tanks. The concept of the new light tank was worked up more precisely in 1946 by the US Ordnance Department



A useful view of the "family" of US Cold War tanks. The M41, visibly the lightest of the tanks, is on the right. To the rear are two medium tanks, the M47 Patton on the left and its successor, the M48 Patton, in the rear center. The heavy tank at the front is the T43, which in April 1956 was designated the M103. (Bettmann/Getty Images)



President Harry S. Truman stands next to an early iteration of the M41, the T41, in February 1951. At this stage of development, the tank was fitted with the distinctive machine-gun "blisters" either side of the hull, but these were impractical and were removed for the T41E1 prototype. (NARA/Wikimedia/Public Domain)

and Army Group Forces, resulting in a program called T37 Phase I. Two prototypes were built, these featuring the 76mm T94 gun, all-welded armor, torsion-bar suspension, and a 500hp engine.

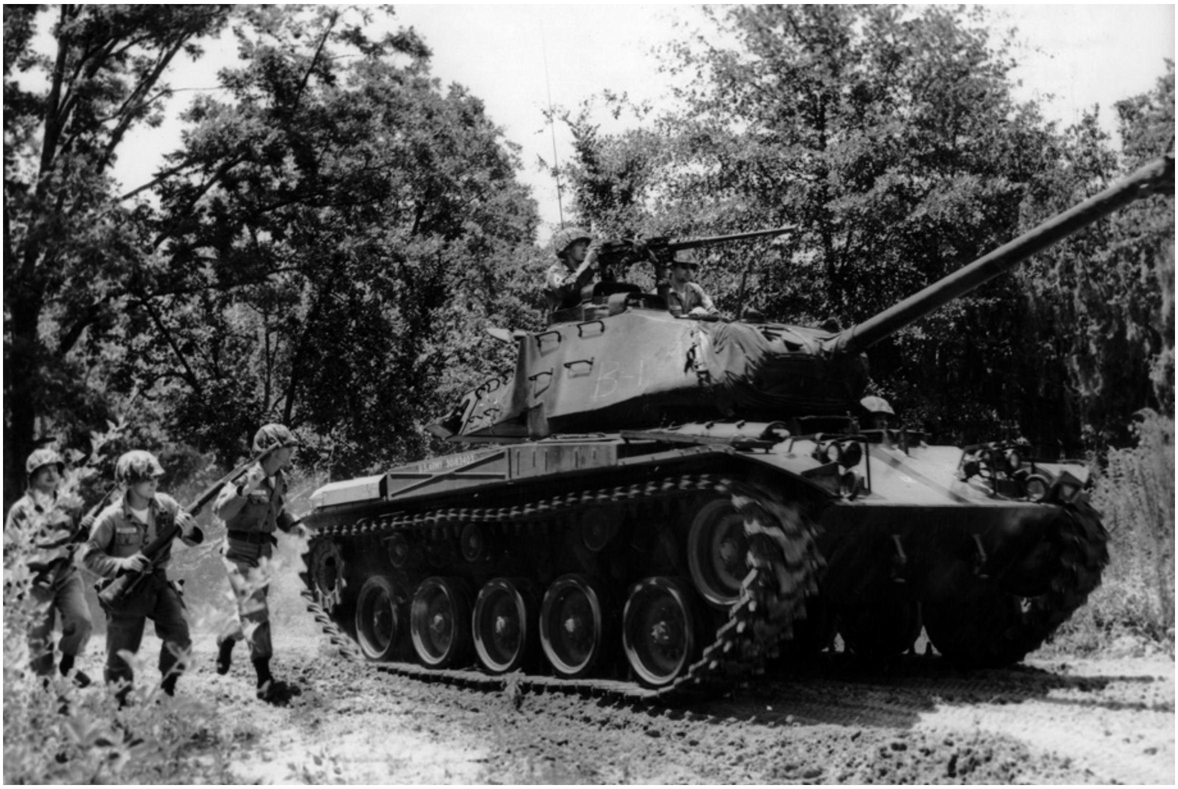
Two more prototype improvement programs followed as the design was fine-tuned. In Phase II, the single prototype included a new turret design that utilized both cast and welded armor, and which housed the 76mm T91 gun. (Cast armor is more resilient, being made from a single piece of metal without joints, but is difficult and expensive from a production standpoint. Welded armor, connected together in sections, is much less expensive but suffers from weaknesses at the joints.) The Phase II vehicle also had less space for ammunition stowage, to make room for an improved fire-control system, featuring a super-imposed coincidence rangefinder connected to a two-axis Vickers gun-stabilization system (Foss 1984: 138). Next came the Phase III prototype, with an automatic loading device to increase the rate of fire, an important consideration in a light tank, plus an improved stabilizer.

The T37 Phase II was selected for advancement, and was redesignated the T41, with three prototypes produced under this evaluation and testing stage. There was still much to be done, however, and the T41 was heavily modified to improve its crew functions and fire control. Enhancements included removing the two .30-caliber machine guns, individually set in "blisters" on either side of the turret (part of the original Phase I design), plus increasing the turret-ring diameter and shifting both the commander's and gunner's positions to the right side of the tank (they had previously been on the left). The modified vehicle was designated the T41E1, and it was deemed to be approaching the service standards.

Responsibility for taking the T41E1 into production fell upon the Cadillac Motor Car Division of General Motors Corporation. Cadillac was faced with an immediate problem, in that its existing plant in Detroit did not have anywhere approaching the capacity to manufacture the new tank. Thus Cadillac invested heavily in developing a new plant in Cleveland, Ohio, in the process training 6,500 new workers and involving nearly 3,000 main/sub-contractors of various descriptions.

From mid-1951, T41E1s began to roll out from the Cleveland Tank Plant in substantial numbers. In November 1951, however, the US Army introduced some new requirements into the tank's evolution, stating that the power-control system for the turret and gun had to be capable of bringing the weapon to bear on the target within five seconds of target acquisition (Hughes 2010: 3). This requirement necessitated the development of a new oil gear system with faster mechanical action, and those tanks fitted with this system (from serial number 1803) were labeled as the T41E2.

Although substantial numbers of T41s were now being manufactured, multiple US Army requests for improvements – more than 4,000 engineering design changes between July 1951 and July 1952 – meant that official approval to issue the tanks to units was a long time in coming. Some 1,631 baseline M41s were placed in storage at the Ordnance Corps Depot in Lima, Ohio, until they were modified to the appropriate standards. In November 1952, the US Army gave approval for the tanks' issue to service units, and on May 29, 1953, the T41E1 was officially designated the Tank, Combat, Full-Tracked, 76mm Gun, M41, while the T41E2 was redesignated the M41A1. Both tanks also had the appellation "Walker Bulldog." Initially the tanks were known as the "Little Bulldog," but they acquired the additional "Walker" name in honor of General Walton H. Walker, a US four-star general who had served in



US soldiers of the Georgia National Guard conduct a joint infantry–armor exercise with their obviously new M41 tank in July 1961. The stenciled section on the side is a fender box for storage. (Georgia National Guard/ Wikimedia/CC BY 2.0)

M41A3 LIGHT TANK

General
Crew: four (commander, gunner, loader, driver)
Weight (loaded): 23,495kg

Dimensions
Length (gun forward): 8.212m
Length (hull): 5.819m
Width: 3.198m
Height: 2.726m (to top of cupola)
Ground clearance: 0.45m
Length of track on ground: 3.251m
Track width: 533mm

Armor
Hull glacis: 25.4mm at 30°
Hull nose: 31.75mm at 45°
Hull sides: 19–25.7mm
Hull rear: 19mm
Hull top: 12–15mm
Hull floor: 9.25–31.75mm
Turret front: 25.4mm
Turret roof: 12.7mm
Turret mantlet: 38mm

Armament
1 × 76mm M32 gun
1 × .30-caliber Browning M1919A4E1 coaxial machine gun
1 × .50-caliber Browning M2 HB antiaircraft machine gun

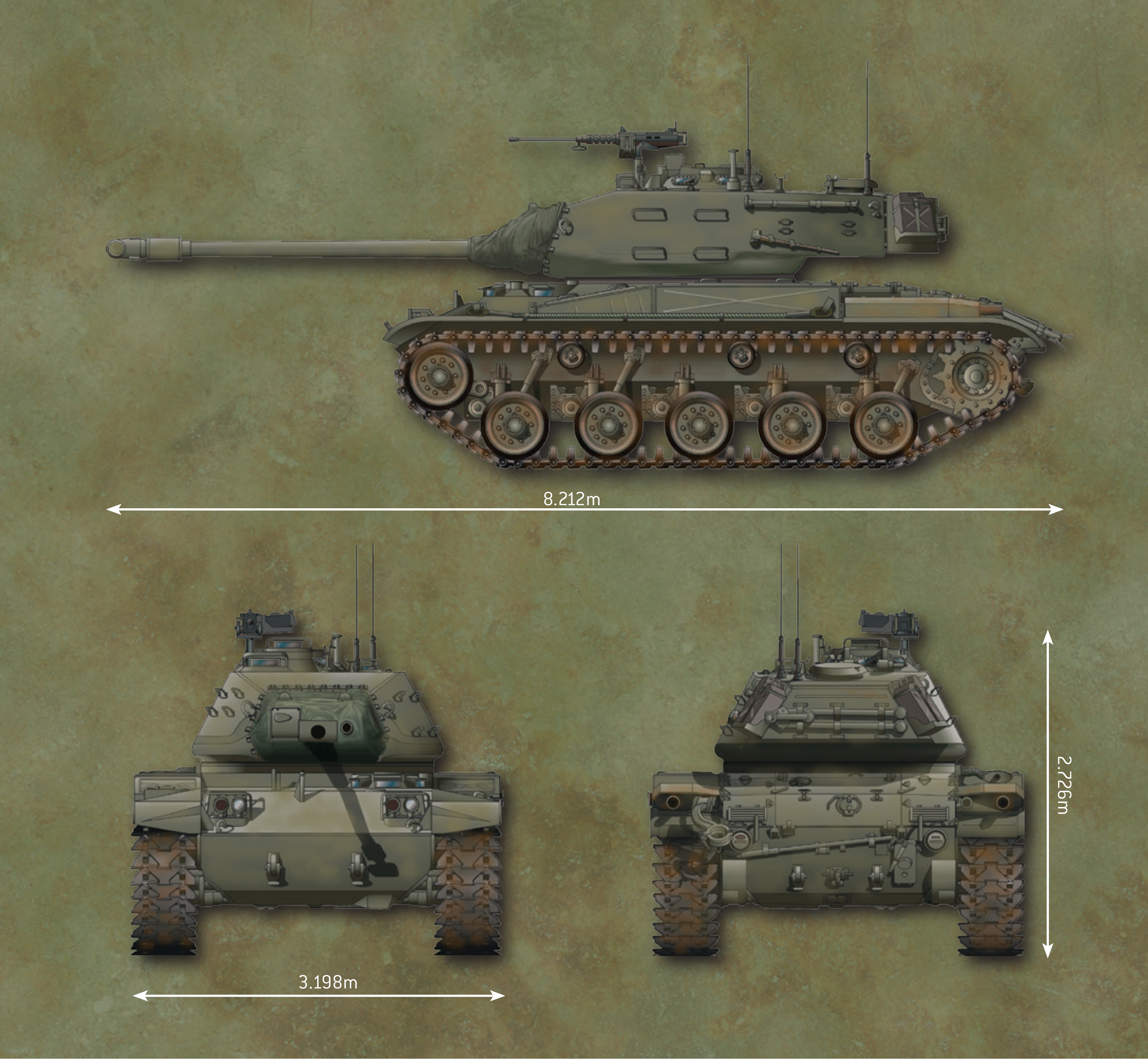
Motive power
Powerplant: Continental or Lycoming AOS-895-5 6-cylinder, air-cooled, supercharged gasoline engine developing 500bhp (373kW) @ 2,800rpm

Performance
Ground pressure: 0.72kg/cm^2
Maximum speed (road): 72km/h
Maximum speed (off-road): 30km/h
Fuel capacity: 530 liters
Range: 161km
Fording: 1.016m or 2.44m with fording kit
Gradient: 60 percent
Side slope: 30 percent
Vertical obstacle: 0.711m
Trench: 1.828m

World War I, World War II, and the Korean War, dying in a traffic accident involving his Jeep in South Korea on December 23, 1950.

In terms of its basic properties and layout, the introductory pages to the later FM 17-80 *Tanks, 76-mm Gun M41 and M41A1 Walker Bulldog Technical Manual* clarified the essentials:

> The Tank, 76-mm Gun, M41 and M41A1 are lightly armored, full-track, low-silhouette, combat vehicles, each manned by four crewmen and armed with a 76-mm high-velocity, flat-trajectory gun and a caliber .30 coaxial machinegun. A caliber .50 machinegun is mounted on the turret for use by the tank commander. Each tank has a forward hull compartment for the driver and for ammunition stowage, a rear compartment for the engine and transmission, and a turret mounting the main



> armament and providing stations for the tank commander, gunner, and loader. (Department of the Army 1956: 4)

There were some subtle differences in addition to those outlined above. The M41 featured a 76mm M32 (T91E3) rifled gun on an M76 (T138E1) mount. The M41A1, however, had a 76mm M32A1 rifled gun on an M76A1 mount.

In its M41 and M41A1 forms, the Walker Bulldog thus entered service as the standard light tank for the US Army. In the mid-1950s, however, came some additional upgrades. An AOS-895-5 fuel-injection engine system was fitted to the powerplant, to improve performance, and there was a new simplified hydraulic turret-traverse system, with direct mechanically linked control of the oil gear pump. The turret also featured dual power traverse by the commander, plus manual mechanical (rack and

The M41 was issued to many US National Guard units. Here we see a formation of Guard M41s moving through the streets of Clinton, Mississippi, on September 1, 1956, during policing activities following race riots. (Robert W. Kelley/The LIFE Picture Collection/Getty Images)

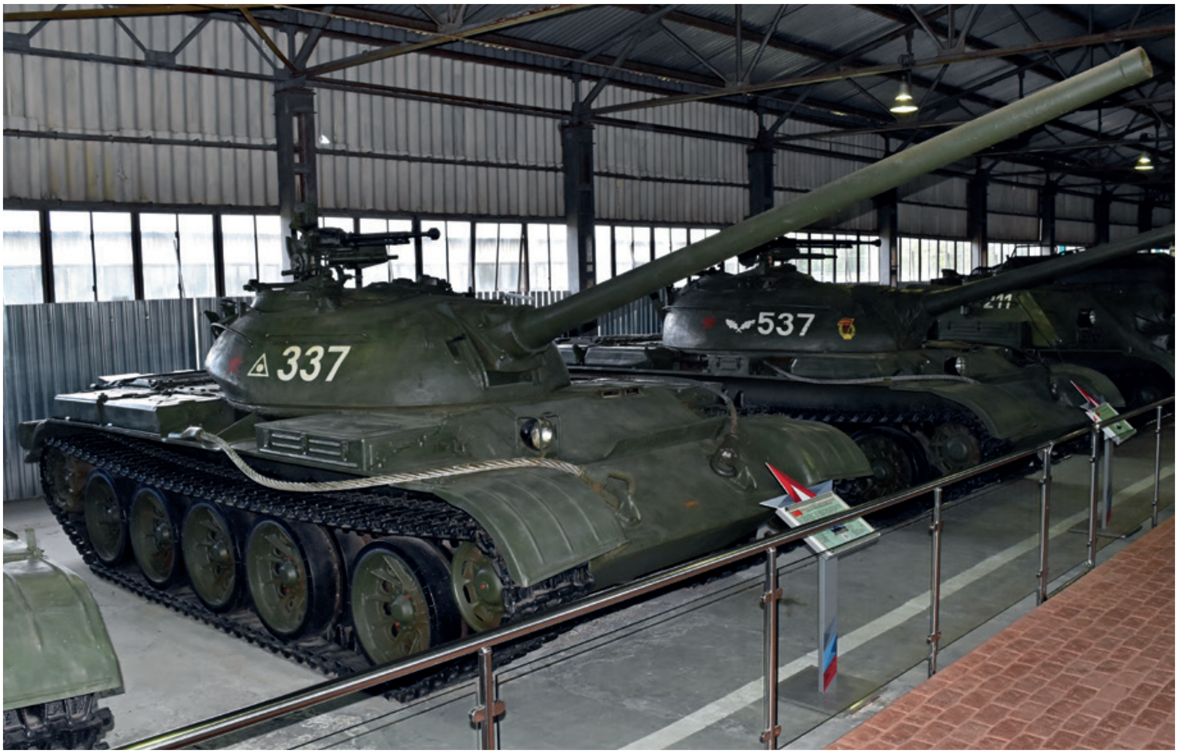
pinion) elevation for the gunner, and slewing elevation control for the gun (Foss 1984: 141). M41 tanks given this overhaul were designated the M41A2, while M41A1 tanks thus modified became the M41A3.

The M41A3 was not the end of the production story of the Walker Bulldog. In the US military, the M41's chassis and some of its component parts were utilized to create other vehicles, including the M42 Duster antiaircraft vehicle, the M44 and M52 self-propelled howitzers, and the M75 APC. Some 5,467 M41 types were manufactured by Cadillac between 1951 and 1954. Yet apart from some small-scale service in the Korean War, they saw little combat in US hands; indeed, by the mid-1960s they had been phased out of US service. In the new Cold War order, however, large stocks of surplus armored vehicles represented export opportunities, and in this regard the M41 was a notable success. In total, 30 countries accepted the Walker Bulldog into service; and today, seven countries have this vehicle still in service, albeit with significant upgrades to kit.

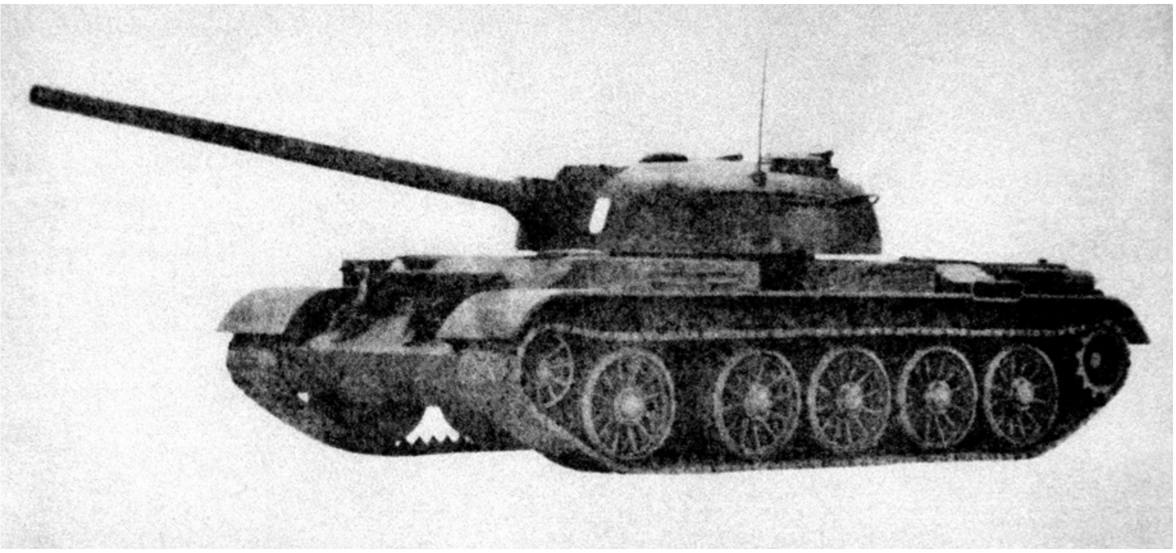
South Vietnam began to receive the first of 350 US-surplus M41A3s in 1965, as the United States sought to bolster the ARVN against the increasingly confident Viet Cong and PAVN campaigns. As with much of the US weaponry and equipment received by South Vietnam, the M41s were exported largely as they were manufactured, the only modifications coming from field exigencies and the requirements of localized repair.

THE T-54

Alongside the PT-76 amphibious light tank (another Vietnam War veteran), the T-54 was the first of a new generation of postwar Soviet MBTs. The ancestry of this tank is traceable back to the legendary T-34 medium tank, that masterpiece of combat functionality and mass production that truly altered the balance of power on the Eastern Front during World War II. Beyond its legendary status, however, the T-34 had its share of faults, not the least being that its large Christie suspension system restricted space inside the vehicle, making it a cramped tank in which to operate. Introducing the 85mm S-53 gun and then the 85mm ZiS-53-S gun to the T-34 in 1944 helped overcome some of the inadequacies of the initial 76.2mm F-34



This photograph, taken in the Kubinka Tank Museum, usefully shows the final evolution of the T-54 turret shape. Tank no. 337 is an Obiekt 137 tank, and still exhibits the undesirable shot trap at the rear underside of the turret; this shot trap has been eliminated in the T-55A next to it. (Alan Wilson/Wikimedia/ CC BY-SA 2.0)



A 1960s US military image of the T-54. The heading states that the image refers to an "infrared night-driving device," and the gunner's periscope port is highlighted in white, although this tank does not appear to have the infrared searchlight fitted. (US DoD/Wikimedia/Public Domain)

gun, but Soviet ordnance designers recognized that the future lay with an even more potent weapon, one that could outgun the latest and future generations of heavy tanks. The new tank also needed heavier armor to increase its battlefield survival; encounters with the 88mm guns of German tanks had proved as much. Eventual replacement of the T-34 lay largely in the hands of Aleksandr A. Morozov, chief designer at the Uralvagon Zavod tank plant no. 173 in Nizhny Tagil, and a contributor to the design of the original T-34 (he was responsible for the transmission design). The replacement program was codenamed Obiekt 136, and began in earnest in late 1944.

Two designs emerged as stepping stones toward the T-54. The first was the T-43 medium tank, which among other innovations switched to a more compact torsion-bar suspension that saved interior space. The T-43 also had a three-man turret – as opposed to the two-man version of the T-34 – a five-speed gearbox, and slightly increased armor thickness. Yet in many ways the T-43 was still a T-34 derivative, and one that had a limited postwar production run because of mechanical issues. The next step forward was the T-44 medium tank, which was essentially an attempt to upgrade the main gun of the Soviet medium tanks to something with higher performance. The first T-44 prototypes were equipped with the 85mm D-5T and 122mm D-25-44T guns; to cope with the larger breech, the T-44 also had an innovative transverse engine layout, the engine being placed perpendicular to the direction of travel to save space for the crew inside the vehicle. Eventually, however, the T-44A tanks that entered service in November 1944 had the 85mm ZiS-S-53 gun as fitted to the T-34/85. Thus in late 1944 and 1945, Morozov and his designers focused their attention on fitting a 100mm gun to the T-44. They had several options: the D-10S (as fitted to the SU-100 tank destroyer), the prototype ZiS-100, and LB-1. The D-10S emerged as the forerunner under the name D-10T ("T" for *tankovaya*, "tank"), but attempting to fit a large piece of ordnance into an already cramped fighting space revealed that a new design was called for. Thus on November 1, 1944, Morozov and his team received orders from the People's Commissar for Tank Production of the Soviet Union, Vyacheslav A. Malyshev, to develop a new tank design suited to the new 100mm gun and with superior MBT design features. This tank was initially known as Obiekt 137, but later became the T-54.

The designers had a tough set of criteria to meet. Not only did the new tank have to incorporate the larger gun convincingly, it also had to support the weight of the most substantial armor possible, offer the highest levels of power and mobility, provide decent crew space and ammunition storage capacity, and have a silhouette that was as low as possible – not easy given the need to fit so much into the interior. The first prototype emerged from the Nizhny Tagil plant on January 30, 1945; it was based heavily on the T-44 layout, with a T-34 driveline, but with a distinctive new cast-armor turret mounting the D-10T gun. The armor on the turret front was now 200mm; on the T-44 it was just 120mm. Another significant change was the powerplant: a V-54 V-12 water-cooled diesel, generating 500hp. Following testing and evaluation, several modifications were made, principally by switching to a toothed drive sprocket (as opposed to the roller engagement drive sprocket of the T-34 system) with narrower cast tracks (Kinnear & Sewell 2018: 13). This version became known as the T-54 Model 1946 or T-54-1, and it was accepted for Soviet Army service on April 29, 1946. The first production series of the tank was the T-54

A Chinese Type 59, of the type used extensively by the PAVN during the Vietnam War, is loaded onto a barge on the Mekong River in Phnom Penh during a partial withdrawal of Vietnamese forces from Cambodia, May 9, 1983. (Alex Bowie/Getty Images)

T-54B MAIN BATTLE TANK

General
Crew: four (commander, gunner, loader, driver)
Weight (loaded): 36,000kg

Dimensions
Length (gun forward): 9m
Length (hull): 6.45m
Width: 3.27m
Height: 2.4m (without roof-mounted AA gun)
Ground clearance: 0.425m
Length of track on ground: 3.84m
Track width: 580mm

Armor
Hull glacis: 100mm at 60°
Upper hull sides: 70mm at 0°
Hull rear: 60mm
Hull floor: 20mm
Hull roof: 30mm
Turret mantlet: 170mm

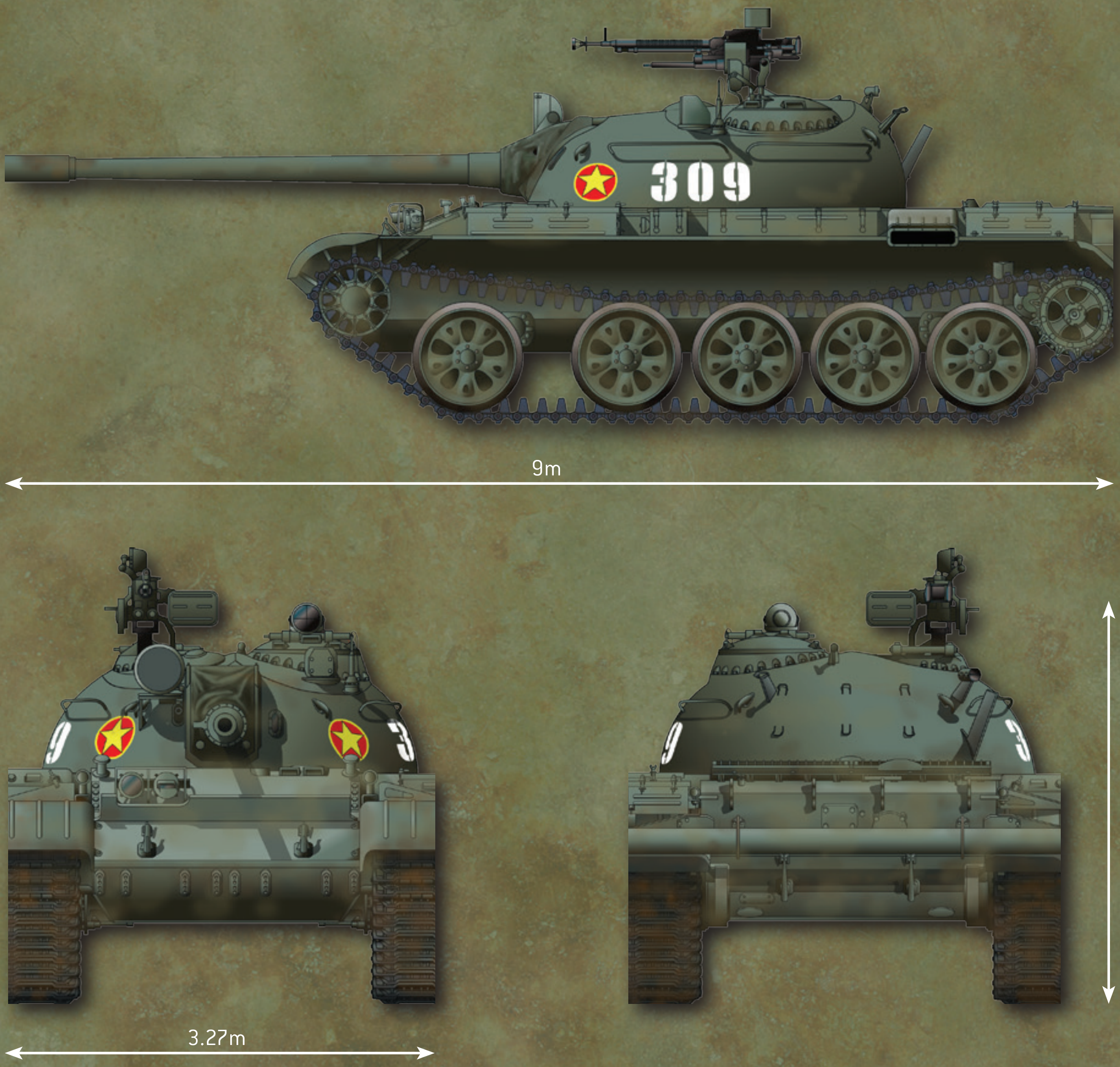
Armament
1 × 100mm D-10T gun
1 × 7.62mm PKT-T coaxial machine gun
1 × 12.7mm DShKM antiaircraft machine gun

Motive power
Powerplant: Model V-54-6 V-12 water-cooled, 38.88-liter diesel engine developing 520hp (388kW) @ 2,000rpm

Performance
Ground pressure: 0.81kg/cm^2
Maximum speed (road): 48km/h
Maximum speed (off-road): 35km/h
Fuel capacity: 812 liters
Range: 400km
Fording: 1.4m or 5.486m with snorkel
Gradient: 60 percent
Side slope: 40 percent
Vertical obstacle: 0.8m
Trench: 2.7m

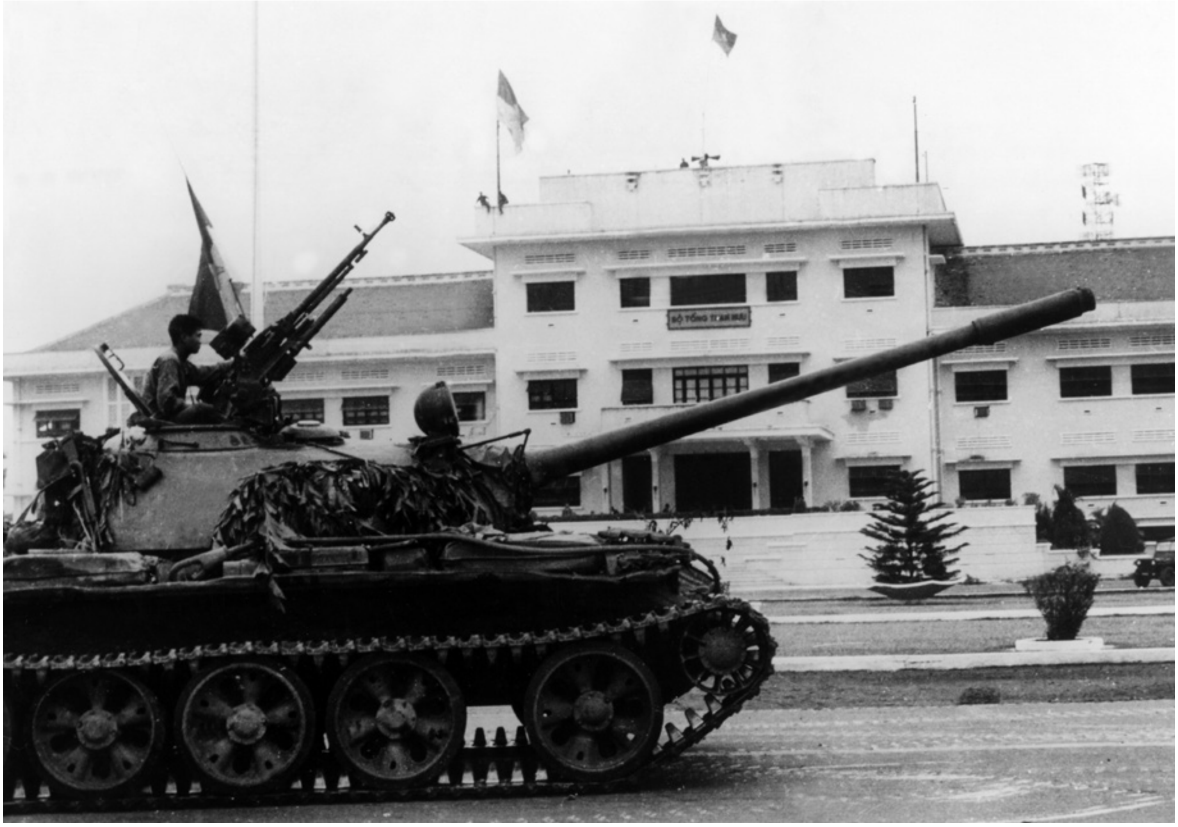
Model 1947; 713 were built, 96 of which were used as training tanks (Kinnear & Sewell 2018: 26).

Despite the official endorsement, the T-54 development journey was largely just beginning. Trials in the Byelorussian Military District revealed a host of practical and mechanical issues, and Soviet authorities were concerned about the T-54-1's overall turret shape, which although sleek had undercut sections on the lower surfaces that presented potential shot traps, plus a similarly vulnerable wide gun mantlet. The turret was duly revised, and the modified tank was presented in March 1949 as the T-54-2, or T-54 Model 1949. Although a rear undercut was still present, as a weight-saving measure, most of the turret shot traps had been eliminated, and the gun mantlet was now of a narrow "pig snout" profile. The T-54-1 had previously had 7.62mm Goryunov machine guns mounted in machine-gun bins on the fenders, but in the



T-54-2 these were deleted in preference for a single machine gun mounted in the hull glacis. The glacis armor was reduced to 100mm from 120mm, to save weight; total tank weight was now 37.5 tonnes. There were also some welcome internal changes, including the fitting of a fire-suppression system.

In total, 2,523 T-54 Model 1949 tanks were produced at three plants (Nizhny Tagil, Kharkov, and Omsk). Feedback from operators nevertheless meant that development work on the tank was an ongoing process. Still the turret design was giving some problems; the rear of the turret retained some shot traps, and the weight of the turret was poorly distributed. Accordingly, in 1950–51 the turret profile was once again revised, resulting in the definitive smooth "eggshell" shape, with all of the rear shot traps removed. It was this turret shape that gave the T-54 its signature profile. This version of the T-54 was known as the T-54-3, or T-54 Type 1951.



A T-54B tank passes in front of the headquarters of the South Vietnamese General Staff in Saigon in 1975. Note how the tank is fitted with the L-2 *Luna* spotlight mounted coaxially to the main gun, a characteristic of the T-54B. (ADN-Bildarchiv/ ullstein bild via Getty Images)

Production of the T-54 was, by this time, significant: 10,245 of the first three models between 1947 and 1955 (Kinnear & Sewell 2018: 25). Yet the tanks that ultimately went into North Vietnamese service in the late 1960s were a further generation on in refinement. As the 1950s progressed, there was something of a reshuffle in the Soviet tank-design organization. Morozov moved away from development of the T-54 to focus his efforts on Obiekt 430, which would become the T-62. Further refinement of the T-54 now fell into the hands of Leonid N. Kartsev at Nizhny Tagil. In 1952–53 Kartsev and his team, responding to MBT developments in the United States, began to look at ways to fit a gun-stabilization system to the T-54, specifically the STP-1 *Gorizont* ("Horizon") single-plane system, which offered vertical axis stabilization. The program was designated Obiekt 137G, and after trials and testing on 25 prototypes the new variant was accepted into service on March 8, 1955, and designated the T-54A.

This model, with the STP-1 fitted to the new 100mm D-10TG gun plus an upgraded TSh-2A-22 telescopic sight (see below), had significantly enhanced gunnery compared to the previous version; the gun now also had powered elevation. There were several other improvements. The D-10TG gun featured a bore extractor near the muzzle, which – combined with a new multistage air cleaner – improved the atmosphere inside the tank. It was also safer, with the introduction of an automatic fire-extinguisher. The T-54A was now more capable of night operations, thanks to a TVN-1 infrared (IR) periscope and the fitting of an external IR driving headlamp; this additional kit was not fitted in the initial production runs, but later became standard. Communications were improved via the new R-113 radio. One interesting optional addition was an OPVT snorkel kit which, when installed on a tank properly prepared, enabled the T-54A to ford waterways up to 5m deep. Further minor mechanical improvements included an electric oil pump, a bilge pump, and a modified air filter (Foss 1976: 68). The wheel type was modified to the cast "starfish" type.

The T-54A was one of the seminal Cold War MBTs, and 4,602 were built in total. The subsequent version, the T-54B, was developed along roughly the same time period as the T-54A, but was approved for production in August 1956. The main point of difference between the T-54A and the T-54B related to gun stabilization. The T-54B received the superior two-axis STP-2 *Tsyklon* ("Cyclone") stabilization system, increasing the first-round hit probability from 30 percent for the STP-1 to 60 percent. The IR capability now came fitted as standard, with the driver having the TVN-2 night-vision device plus the TVN-1, and the commander also received a TPK-1 night sight; a smaller OU-3 IR searchlight would also later be fitted to the commander's cupola. Another significant change in the T-54B was the moving of the smoke canisters to the rear mudguards, creating the space to allow the fitting of two 200-liter auxiliary fuel tanks on the rear of the hull, the fuel from these cells being transferred to the main tanks by hand pumps used by the crew when required (Kinnear & Sewell 2018: 30). A total of 1,155 T-54Bs were built.

The story of the T-54 – especially if non-MBT variants, all export/licensed versions, and also the subsequent T-55 (essentially a T-54 fitted with an NBC package) are included – is a long and involved one. However, in PAVN service it was principally the T-54A and T-54B (both directly exported by the Soviet Union) plus the Chinese Type 59 that faced the ARVN armor in the battles of the early 1970s. Manufactured under license from 1958, the Chinese Type 59 was, to all intents and purposes, a T-54A. In its early stages of production, the Type 59 did not feature any of the IR equipment of the T-54A, although models might have been retrofitted later. (Note that unless specified otherwise, in the following narrative "T-54" is used to refer to all types of T-54 used in the Vietnam conflict.)

TECHNICAL SPECIFICATIONS

WEIGHT, MOBILITY, FUEL CONSUMPTION

As already noted, the M41 and the T-54 occupied different places within the hierarchy of tanks. A quick tour of some of the fundamental specifications, however, raises some interesting points of comparison. The M41 had a fully loaded weight of 23,495kg, in a vehicle that was 8.212m long (including gun in forward position), 3.198m wide, and 2.726m high (to the top of the cupola). By contrast, the T-54 had a loaded weight of 36,000kg, a gun-forward length of 9m, a width of 3.27m and a height of 2.4m.

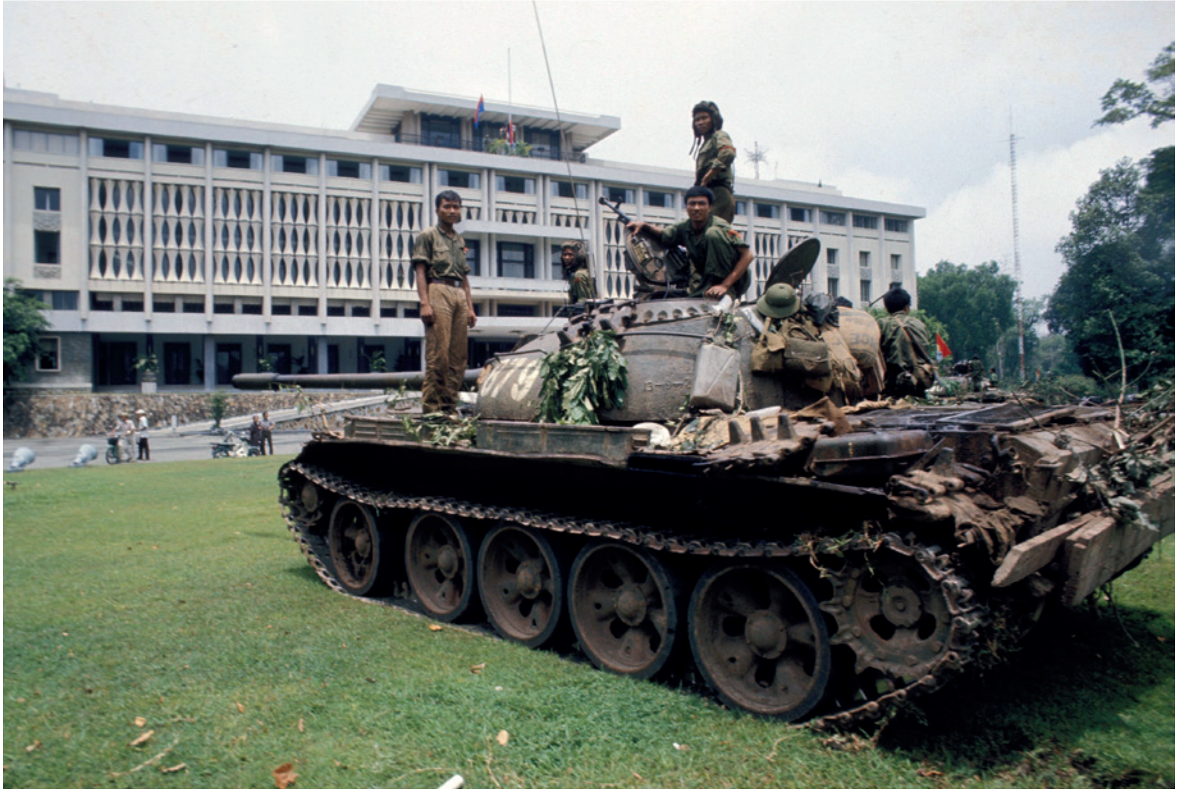
What is striking about these figures is first how close together the specifications are on several counts, considering that light and medium tanks are being compared. The weight difference is naturally wide, with the T-54's loaded weight more than 12,500kg greater than that of the M41, much of this being accounted for by the far heavier armor on the Soviet tank (see below). As it turned out, weight would be a particularly important operational issue in the Southeast Asia theater. As tankers on both sides discovered, much of the terrain in Vietnam and Laos is not conducive to heavy armor movement, the ground often being soft and boggy (particularly around and within rice paddies and other irrigated agricultural land), laced with waterways from minor streams to major river systems, precipitous in the mountainous areas, and studded with thick vegetation growth. All these factors, combined with a low level of preparedness for armor operations (most river bridges in Vietnam had not been designed with up to 36 tonnes of MBT in mind, and roads were often little more than

A girl cycling on the road near Lai Khe, South Vietnam, in 1972, encounters a formation of M41A3s. Note the two towing lugs set on the lower front plate of each tank, used when the tank had to be recovered. (David Hume Kennerly/Getty Images)

hardened dirt tracks), and the glutinous effects of the seasonal monsoon could make tank travel a slow and halting business, frequently requiring the intervention of recovery vehicles. To give an idea of the issues, ARVN M113 APC mechanized units found that just crossing a rice paddy could involve chaining as many as 15 of the vehicles together in parallel columns to keep the formation moving (Starry 1978: 41).

Yet simply because the M41 was smaller and lighter, it should not be assumed that it had a far easier time in terms of cross-country mobility. In fact, the ground pressures of the two vehicles were not widely dissimilar: the M41's was 0.72kg/cm^2, while that of the T-54 was only a little heavier, at 0.81kg/cm^2, by virtue of its longer and wider tracks. Furthermore, the T-54 had the advantages of being able to cross wider trenches, climb over higher vertical obstacles, and ford deeper waterways (especially with its snorkel equipment fitted), although both had the same gradient ascending ability, at 60 percent. Bridge crossing was more of an issue for the PAVN tankers; the PAVN engineers had to become skilled and fast at bridge-laying operations to keep their armor on the move, although weak bridges remained an issue for any armored unit, regardless of what vehicles it operated.

Where weight really should make a difference is in terms of factors such as fuel consumption and speed. Regarding the latter, the M41 certainly had the edge, with an on-road maximum speed of 72km/h compared to the T-54's 48km/h. The US tank could combine that speed with a higher degree of maneuverability, and together these factors were important ingredients of the M41's survivability (if they were used properly). Yet the M41's dash came at the cost of high fuel consumption. On its internal fuel load of 530 liters, it had a range of just 161km, or 3.3 liters per km. The T-54 had 812 liters of integral fuel, and on this it could run 400km, or 2 liters per km. The greater range and fuel efficiency of the T-54 was especially important for the North Vietnamese tankers, who during offensive operations might have to put far greater distances between themselves and their refueling depots during advances.



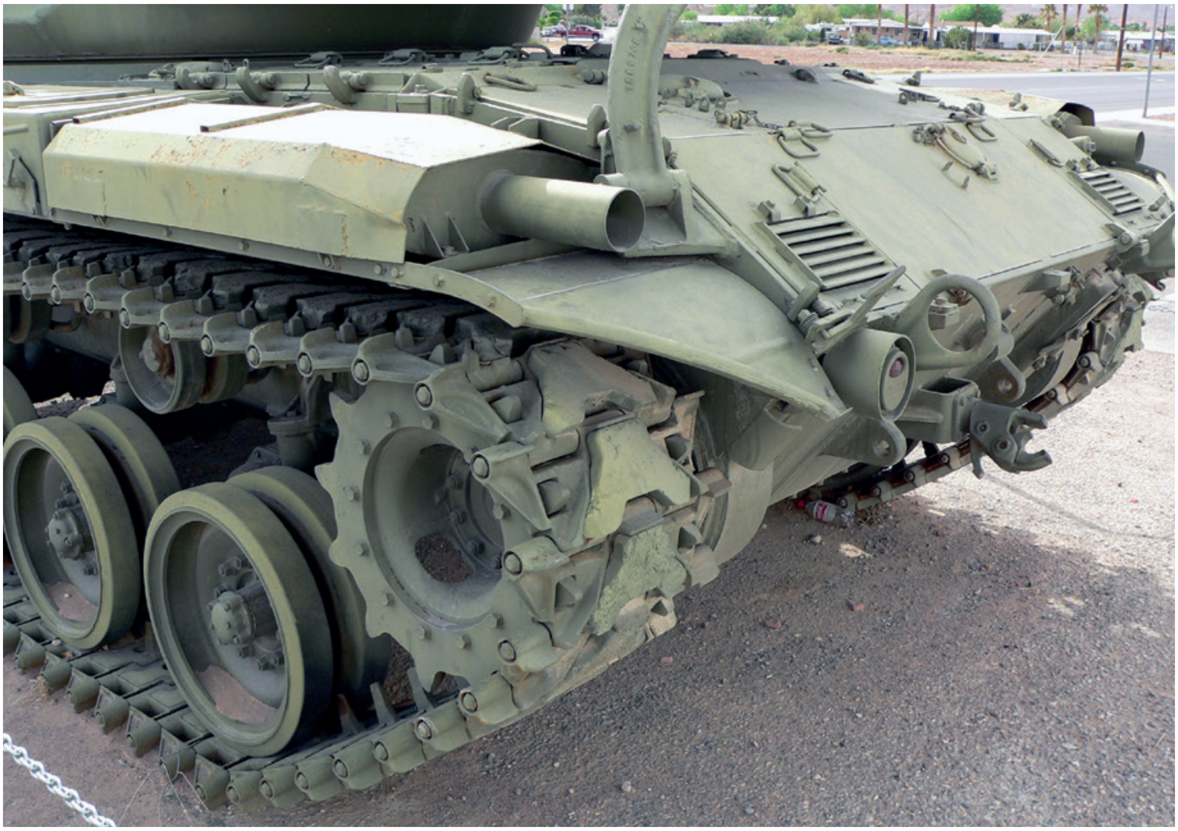
This PAVN T-54, pictured on the lawn of South Vietnam's Presidential Palace in Saigon, is carrying spare track links and also, at the very rear, wooden planks that served as unditching beams should the tank become stuck in soft ground. (Jean-Claude LABBE/Gamma-Rapho via Getty Images)

ARMOR AND SURVIVABILITY

As noted above, the M41's survivability was principally tied to its speed and maneuverability. The T-54, by contrast, shielded its crew with thick wrappings of armor. There was a massive difference between the armored protection on the two vehicles. For the M41, its thickest armor was over the turret mantlet – 38mm of rolled homogenous armor (RHA), with welding at the plate joints offering potential weak spots. The T-54's turret mantlet, by striking contrast, sported 170mm of cast RHA. On the hull glacis, the M41 presented 25.4mm at 30° while the T-54 had 100mm at 60°. The level of difference between the armor on the two tanks reflected the simple fact that while the M41 was primarily designed for reconnaissance and infantry support, the T-54 was intended to confront the best MBTs the West could throw at it.

Another notable factor regarding survivability was that the T-54, despite its heft, actually presented a lower profile than the US tank. The T-54 offered a lower silhouette and was a more difficult gunnery target than the M41, especially if the T-54 crew made intelligent use of the terrain to shield most of the hull. Although the height difference was marginal, mere centimeters could make the difference between a crew surviving the day or being obliterated as the result of a high-velocity shell impact.

To understand the significance of the armor packages, however, requires a slightly deeper exploration into the penetration capabilities of the opposing tank guns and



The rear of an M41. The engine hatch cover armor was only 13mm thick, so the rear of the tank was particularly vulnerable to enemy fire. Another issue was that the exhaust mufflers could glow red at night when the engine had been running for a while, acting as a visual marker for the enemy. (Stan Shebs/Wikimedia/ CC BY-SA 3.0)

their ammunition. The M41s in Vietnam used three main types of 76mm armor-piercing ammunition: the M339 AP-T, the M319 HVAP-T, and the M331A2 HVAP-DS-T. Finding accurate RHA penetration figures for these ammunition types is surprisingly difficult. Educated estimates suggest penetration figures for kinetic energy rounds in the region of 150–200mm at 1,000–2,000m, depending on the angle of armor. Certainly, all these types of ammunition, based on both estimation and combat-derived evidence, seem to be capable of killing a T-54 tank with a frontal hit at about 1,000–1,500m. Furthermore, the M41 had a theoretical maximum rate of fire of up to 12rd/min (much less in reality, but still high), meaning that if one hit did not quite finish the job then the follow-up shots might do so. We can compare this figure to the maximum rate of fire of the T-54, which according to 1969 figures was 7rd/min from a standing position, dropping to 4rd/min when on the move. (Some authorities argue that, in reality, two aimed shots per minute was a likely maximum.)

These conclusions, albeit based on limited data, indicate that the T-54 had reason to fear the M41. On the flip side, the relatively lightly armored M41 had little chance of deflecting an on-target 100mm shell fired from the T-54; penetration depth of vertical armor plate at 1,000m with kinetic ammunition was more than 140mm, depending on shell type. The M41 had the firepower to take on the T-54, particularly under 2,000m range, but the lighter tank's fate hung heavily on the ability of its crew to spot the enemy first and put the first round on target.

US Army M48 Patton tanks confront Soviet T-54s on the streets of Berlin in 1961. This perspective shows to good effect the low silhouette of the T-54, which makes it flatter in the landscape, less easy to spot, and more able to hide behind low cover. (USAMHI/Wikimedia/Public Domain)

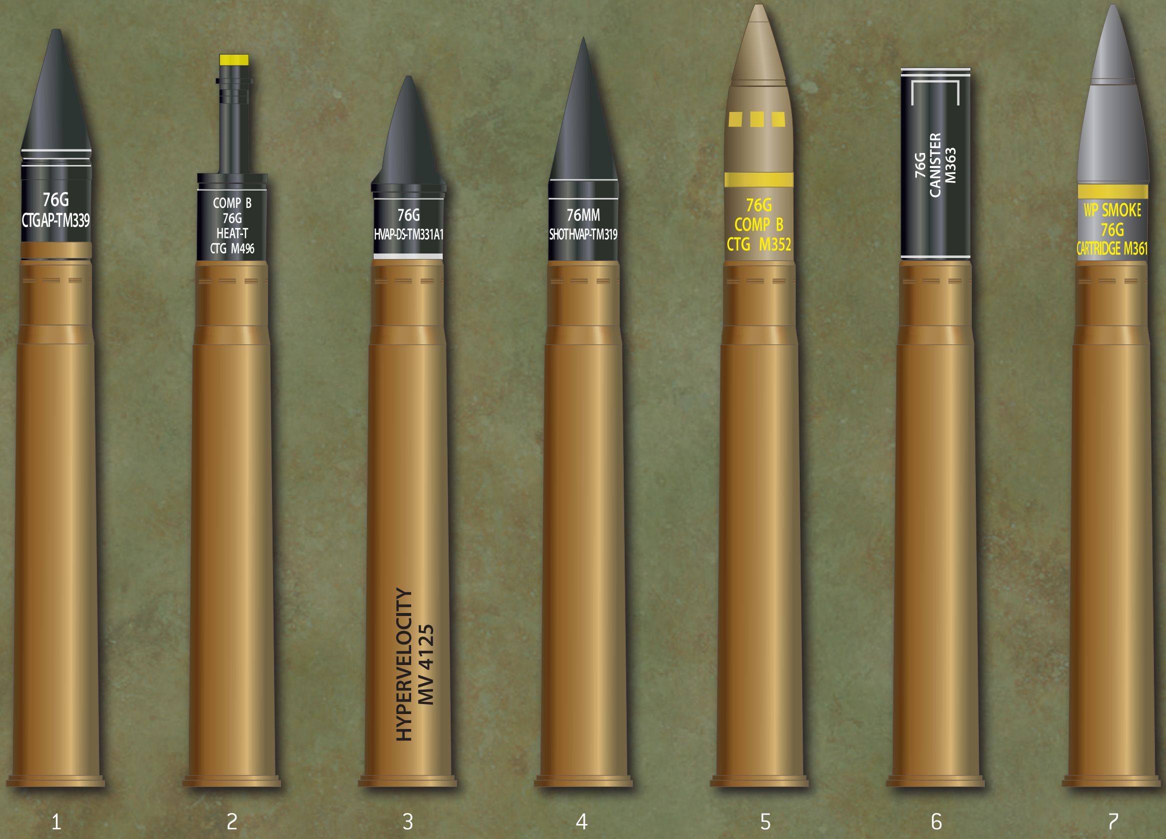
US ARMY CHECKPOINT
YOU ARE LEAVING
THE AMERICAN SECTOR
ВЫ ВЫЕЗЖАЕТЕ ИЗ
АМЕРИКАНСКОГО СЕКТОРА
VOUS SORTEZ
DU SECTEUR AMERICAIN

GUNNERY

The firepower of both the M41 and T-54 relied upon the crew seamlessly and cooperatively performing their duties and utilizing the various fire-control instruments to their optimal effect. On the M41A3, both the tank commander and the gunner had full powered control of the gun and turret, plus independent firing controls, meaning that either crewman could target and engage a target separately if need be. The gunner also had a set of manual controls for turret and gun movement, in case of a critical power failure to those components.

The M41's gunner and the commander also each had sighting systems. In normal combat conditions, the commander would use his sighting equipment only to designate targets for the gunner, although the commander would also take charge of the firing process if laying fire on to targets that the gunner could not acquire visually. Both gunner and commander had an M20 or M20A1 periscope sight, which featured a "one-power system for close-in, wide-angle observation, and a six-power system for sighting" (Department of the Army 1956: 49). Both sights were connected, either directly or through linkages, to the tank's M4 ballistic drive, a range-scale device that enabled the gunner to incorporate the correct elevation into his line of sight, the drive adjusting for both range and ammunition type. One of the features that enabled rapid target acquisition was that the M20 periscope sight's elevation line of sight could be manually operated independently of the gun, from 22° to 32°, if the gun was at maximum depression, meaning that the gunner could easily scan the terrain without having to move the gun with the sight. When the target was found, the gun was then snapped to the sight picture. Maximum elevation of the gun itself was 19.75°, maximum depression was 9.75°, and traverse was 360°.

M41A3 76mm AMMUNITION



There were four main armor-piercing ammunition types for the M41's 76mm gun. The M339 AP-T (**1**) was an armor-piercing shell type. Its armor penetration was performed by a solid tungsten projectile, which achieved a muzzle velocity of 954m/sec and had a maximum flight range of 14,704m, although the effective range when fired from the M32 gun was well below that. The base of the projectile had a tracer component for visually tracking the shot.

The M496 HEAT-T (**2**) high-explosive antitank shell relied upon shaped-charge effects rather than kinetic energy to achieve penetration. As HEAT shells perform better when not spin-stabilized, the M496 shell was fitted with a stabilizing fin and boom assembly. Maximum range was 7,488m and the muzzle velocity was 1,060m/sec.

The M331A1/A2 HVAP-DS-T (**3**) round's sub-caliber penetrator consisted of tungsten-carbide steel covered with a steel sheath, set inside the sabot. (HVAP-DS-T stands for "High-Velocity Armor-Piercing–Discarding-Sabot–Tracer.") The APDS principle achieves extremely high muzzle velocities; in the case of the M331 it was 1,231m/sec, giving it a prodigious maximum range of 21,607m. The differences between the A1 and A2 variants were subtle distinctions in cartridge case and tracer compound. The M319 HVAP-T (**4**) was similar to the M339, but had a projectile core of tungsten carbide with an aluminum windshield. The result was a faster shell (1,234m/sec), but with a shorter maximum range of 9,885m.

Beyond the armor-piercing types, the M41 tank could fire a variety of antipersonnel and specialist types of shell. The M352 HE (**5**) was the standard high-explosive shell, designed for fragmentation and blast effects; the warhead contained 0.66kg of Composition-B explosive. The M363 (**6**) was an antipersonnel canister round, the projectile containing multiple steel balls with a total weight of 4kg. When the projectile left the muzzle, air pressure and centrifugal force ruptured the container, leaving the metal balls to fly on to a maximum range of 155m. The M361 smoke shell (**7**) consisted of a thin-walled outer casing containing white phosphorus (to create the smoke) and a tetrytol bursting charge. As well as smoke effects, the white phosphorus would also produce anti-personnel effects, including burning and choking.

BAN NÔNG-NGHIỆP

This M41A3 appears to have been the victim of a "mobility kill," the tracks and wheels smashed by an impact. The front idler wheel and one of the track roller assemblies have completely gone. Summarizing the combat capabilities of the M41 and T-54, we can say that defensively (armor) and offensively (long-range gunnery) the odds were stacked largely in favor of the T-54. However, those odds could be tipped by the M41's maneuverability and speed; if it could get into a good firing position faster than the enemy, the M41 was quite capable of killing a T-54. (Jean-Claude LABBE/Gamma-Rapho via Getty Images)

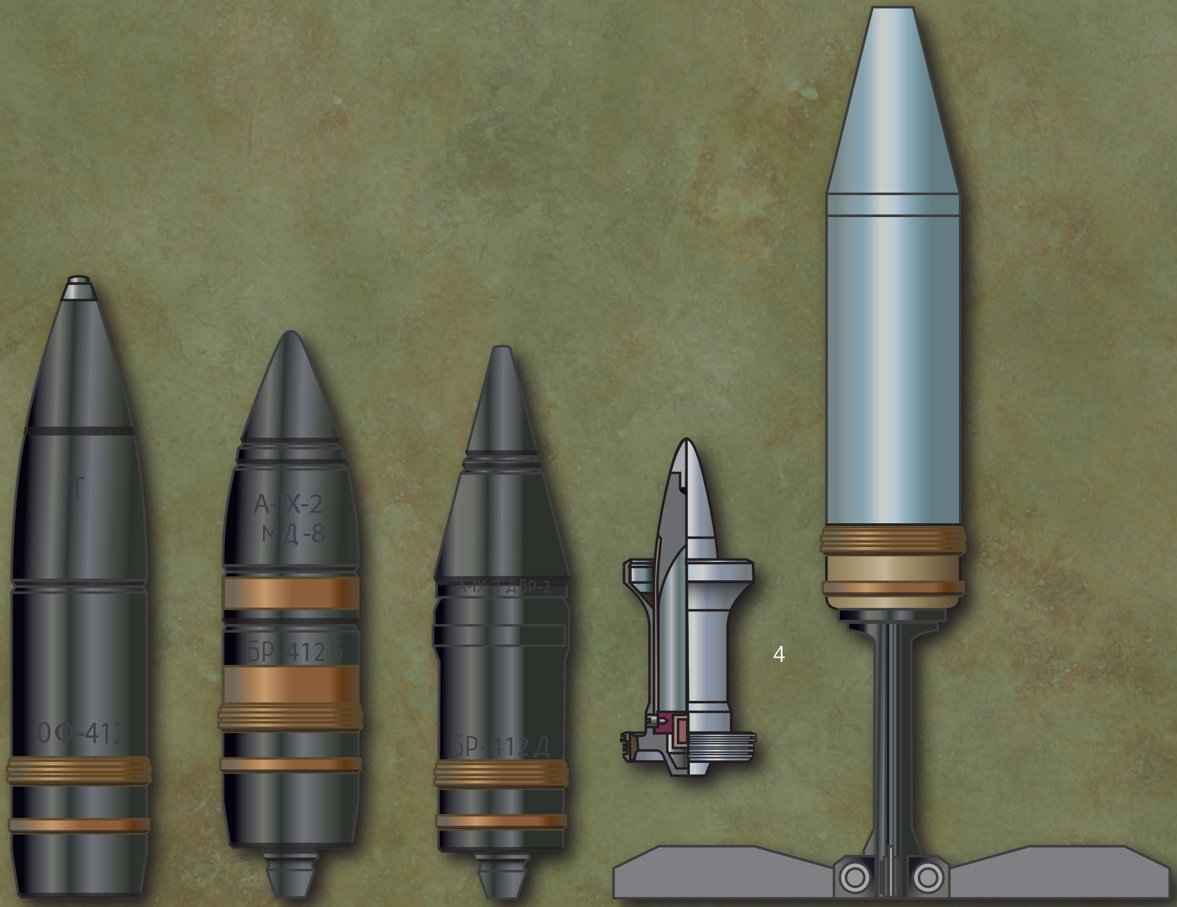
In addition to the M20 periscope sight, the gunner was also equipped with an M97 straight-tube direct-sighting periscope, should the M20 system fail for any reason. The M97 was a simple device with an 8× magnification and a 7° field of view, plus a simple sighting reticle graduated for the AP-T ammunition, with the center of the cross representing zero elevation and zero deflection when the sight was used for boresighting the tank gun set-up. Each horizontal line and each vertical space represented 5 mils of deflection, while each vertical line and space represented a range change of 200yd (182m) (Department of the Army 1956: 55).

The M41 featured some basic but efficient auxiliary fire-control equipment to enable the gunner and commander to put rounds on target. The M4 ballistic drive has already been mentioned. Set on the right side of the gunner's seat (and therefore visible to the commander sat above him) was the M31 azimuth indicator. This device, which was synchronized with the turret ring, measured horizontal angles of traverse, and was mainly used for laying the gun for indirect fire. The M1 gunner's quadrant and the M9 elevation quadrant assisted in applying the correct elevation to the gun for indirect fire.

The T-54's gunnery had an immediate difference from that of the M41 in that the tank commander did not have turret or weapon controls (he could operate the turret traverse lock), although his very close physical proximity to the gunner meant that he could lean over and operate the gunner's controls if need be. The commander's primary battlefield vision came from one of several different types of periscope mounted in the cupola. The TPK-1, introduced on the T-54 Type 49 and used on the T-54A, had a binocular layout, a 2.5× magnification (still poor, but better than the previous non-magnifying Mk 4), a stadiametric rangefinder for quick range calculations, and, most significantly, a target designation system. In the latter, the commander could fix a target with his sight, and using the mechanical relationship between the cupola and turret, the turret would swing to face the target, thereby saving valuable seconds between target acquisition and first shot. With the T-54B the commander received the TPKUB (single operating handle) or TPKU-2B (dual operating handles) binocular periscope; many T-54As were also retrofitted with this system. The TPKUB and TPKU-2 had much the same capabilities as the TPK-1, including target designation, but had an adjustable magnification of either 1× or 5×. By all accounts it was a highly effective sight; in tests the average time to range acquisition on a target was 3.3 seconds.

If the T-54 was expected to be operating at night, the TKN-1 periscope, introduced in 1951, could be swapped in. It had a 2.75× magnification and a 10° field of view,

T-54 100mm AMMUNITION



At the time of the Vietnam War, PAVN T-54 tanks used five types of shell. Here only the warheads are shown, but each shell would have been of the fixed type, with the cartridge case attached directly to the warhead.

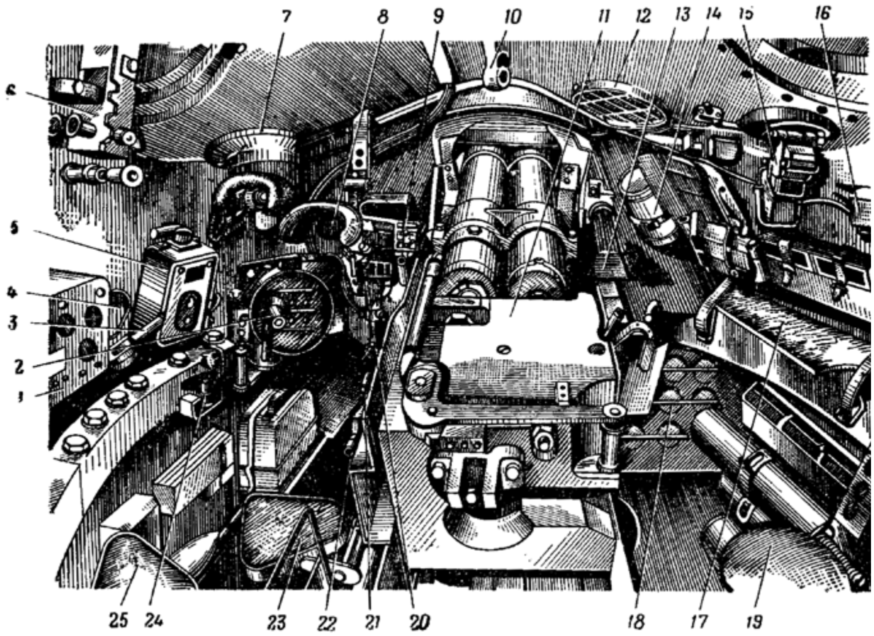
The OF-412 (**1**), an HE-Frag shell, was employed for antipersonnel effects. The total shell weight was 15.6kg, including the explosive charge of TNT.

Issued from 1946, the 53-BR-412B (**2**) was one of the earliest types of T-54 armor-piercing ammunition, made from hardened steel with a ballistic cap.

The 53-BR-412D (**3**), a standard armor-piercing type introduced in 1953, offered ballistic and penetration improvements over the previous BR-412B. It consisted of a steel shell with a soft-steel armor-piercing cap. The complete projectile weighed 15.8kg, of which 0.061kg was the explosive charge component.

The 3BM8 APDS shell (**4**) was introduced in 1967 into the Soviet arsenal. The sub-caliber projectile was made from tungsten carbide, and Soviet figures stated that it could defeat up to 240mm of rolled homogenous armor.

The 3BK5M (**5**) was the T-54's HEAT shell, and was introduced in 1961 alongside the 3BK5 variant, which had a steel liner instead of the better (and more expensive) copper liner of the 3BK5M. The total weight of the projectile was 12.38kg, with an explosive charge of 1.038kg.



A view forward into the turret of the T-54, from the official Soviet manual. The size of the 100mm D-10T gun's breechblock is evident here, with the commander and gun squeezed to the left side of the turret, and the loader to the right. Depending on the ammunition type, the D-10T had a maximum firing range of 14,600m. (Author)

delivered via a combination of active infrared imaging and a first-generation image intensifier module. The TKN-1 was accompanied, in the T-54B, by the TPN-1-22-11 infrared night sight, which could operate in either the active infrared imaging mode or passive light intensification mode, light for the former coming from the L-2 *Luna* spotlight mounted coaxially to the main gun. The reticle of the sight was very simple indeed, and configured only for ranges up to 400m; the sight had a fixed 5.5× magnification and a 6° field of view.

On the M41 the commander and gunner both had a common sight system, the M20, while on the T-54 the gunner had a different set of sighting tools, of ever-increasing sophistication depending on the model the operating unit had acquired. At first the T-54 gunner relied mainly on the Mk 4 periscope for situational awareness, plus the TSh-20 telescope sight, which had a fixed 4× magnification and a 16° field of view. A turret azimuth indicator, by the side of the gunner's seat, enabled indirect fire. With the T-54 Type 1951, however, came the TSh2A-22 with variable magnification of 3.5× and 7× and range scales in the viewfinder for three options of shell plus the coaxial machine gun. This sight was also fitted to the T-54A, and it had a maximum sighted range of 3,900m.

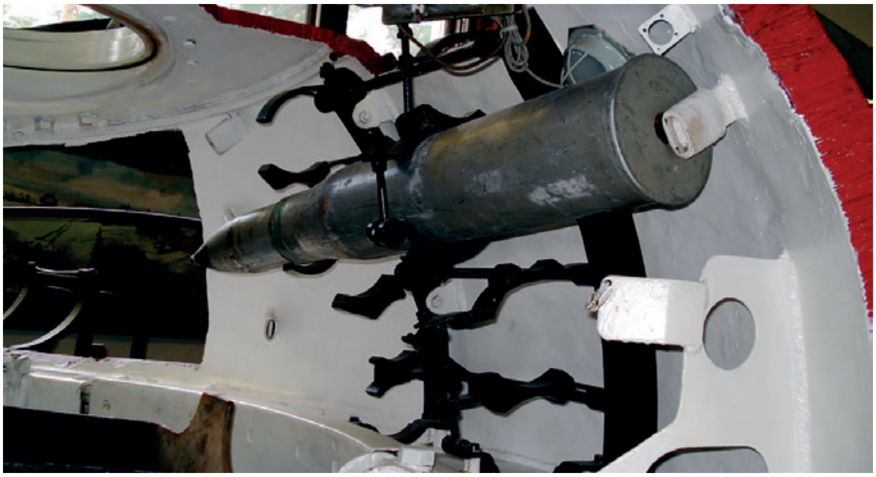
The T-54B, and eventually upgraded T-54As, were primarily fitted with two types of gunnery sights: the TSh2B-32 and the TSh2B-32P. The former was designed to work with the new STP-1 single-plane gun stabilizer, whereas the latter was much the same sight but with a new range scale for 3UBM8 APDS ammunition.

Both the M41 and the T-54, at the time of the Vietnam War, were rather basic in terms of their gunsights, especially in their rangefinding systems. (The T-54 did eventually receive a laser rangefinder in the form of the KDT-1, but this was not fitted to Soviet tanks until 1974.) Compared to, say, stereoscopic rangefinders, stadiametric ranging systems had much lower rates of accuracy beyond 500m. Tests in Europe in the early 1970s compared laser, stereoscopic, and stadiametric rangefinders and while at 1,000m the stereoscopic rangefinder had a 70 percent hit probability, the stadiametric system had only a 34.5 percent hit probability. At 2,000m the hit probabilities plunged to 14 percent and 4 percent respectively. Yet for all this, both M41 and T-54 crews did achieve decent rates of hits on target, even at longer ranges, although sub-1,000m was often the typical combat range for engagements in Vietnam. The stadiametric system was fast in the hands of a skilled gunner; as always, crew standards and experience were essential to maximize the capability of the weaponry.

AMMUNITION STORAGE

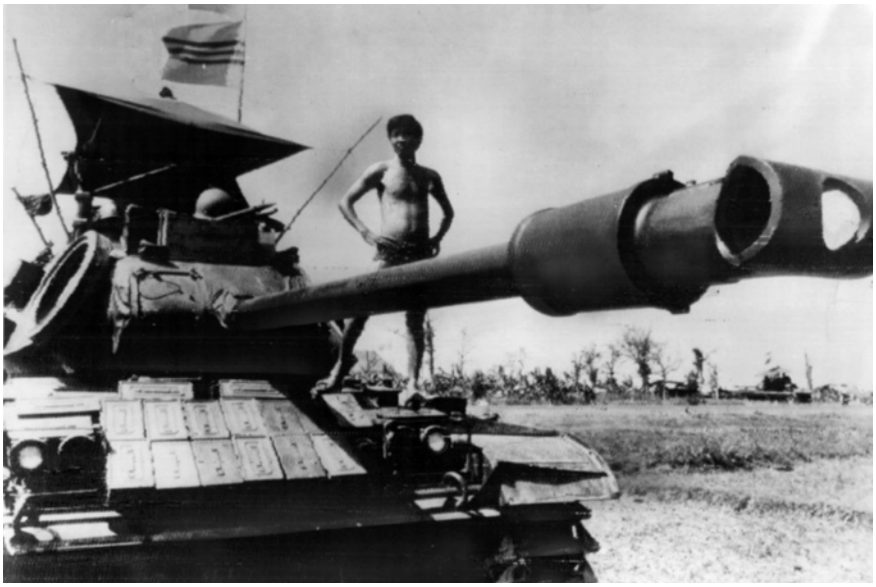
In general, tank ammunition storage is divided into two types: "ready" ammunition, placed in "ready racks" right next to the loader for speedy loading, and non-ready or stored ammunition, the bulk of which is stored in less accessible corners of the hull and turret. (Shells from non-ready racks can be used in action, and are also transferred to ready racks during convenient lulls in the action.) Except in the most intense tank combat, this system usually works fine, as most tank vs. tank engagements are decided in a matter of seconds, with only a handful of shells fired.

There was a notable difference between the M41 and the T-54 when it came to ammunition storage. The M41A3 had seven ready rounds plus 55 stored rounds, the largest volume of the latter (33 rounds) being deposited in the front hull ahead of the gunner. The T-54, by contrast, had capacity for just 34 rounds, with 11 of these mounted in clips on the wall of the turret and hull, as ready rounds. The fact that the T-54 had far less ammunition than the M41 reflected both the compact interior of the tank and the greater size of the shells themselves. Yet it is important to recognize that the destructive effect of each 100mm shell was greater than that of the M41's 76mm ammunition (if it was delivered on target, of course). Also, the distinction between "ready" and "non-ready" ammunition on the T-54 was rather academic, as the non-ready racks were actually within convenient reach of the loader, and could be accessed without problems even during fluid combat situations.



Ammunition ready racks inside the turret of a T-54 training tank. The interior of the T-54 was particularly cramped. With the tank's maximum internal height of 1.6m, any loader above that height would have to be able to perform his duties while either sitting or bending over. (Balcer~commonswiki/ Wikimedia/CC BY-SA 3.0)

An ARVN tanker stands on his vehicle and surveys the scene at Xom Suoi, about 32km north of Saigon. Note the mass of ammunition cans stored on the front hull, plus the awning erected over the turret to provide some shade and to keep down the temperature inside. (Boris Spremo/Toronto Star via Getty Images)



FIELD MODIFICATIONS

The M41 and T-54/Type 59 tanks, as produced by the United States and Soviet Union/China respectively, largely went into service with Vietnamese forces without significant modifications for the new market. Some internal tank signage and instruction manuals would have been translated for reasons of understandability, although most Vietnamese crews would also have had to acquire a familiarity with English, Russian, or Chinese markings. Once in service, all of the tanks underwent the natural field evolution of service vehicles, to suit the preferences of the crews and operational necessities. Radio sets, for example, might be switched out. Turret-mounted machine guns might also be modified or simply removed.

Photographic evidence from the Vietnam War shows a range of field-expedient modifications. Both ARVN and PAVN crews could be seen cladding their vehicles in various forms of camouflage, both foliage and netting. The North Vietnamese were particularly skilled in this regard, as they operated under a far greater threat from ground-attack aircraft, and needed to conceal themselves as much as possible from aerial predation. Given the plethora of shaped-charge infantry antitank weapons used in Vietnam, it was also common for tankers to place sandbags in thick layers around the turret and hull, these being intended to detonate an incoming warhead, thereby dramatically weakening the charge's penetrating jet of molten metal before it actually reached the main armor. Sandbag protection was far from a guarantee of survival, however, and the extra weight could also place a severe strain on the vehicle's transmission, or limit the turn of the turret. Nevertheless, the sandbags doubtless provided a degree of psychological reassurance, as well as some physical protection. Sandbags were also sometimes placed on the floor of the tanks as a form of antimine protection, these being covered with rubber mats intended to limit the upward spall generated by a mine strike. Thick sections of chain-link fence were fitted by ARVN M41 crews as an alternative to sandbags.

OPPOSITE
An M41A3 crushes an automobile during its passage down the streets of Saigon in 1968. The use of this tank as a transport vehicle for various supplies is evident. A total of 74 or 75 track shoe assemblies made up each track of the tank. (Bettmann/Getty Images)

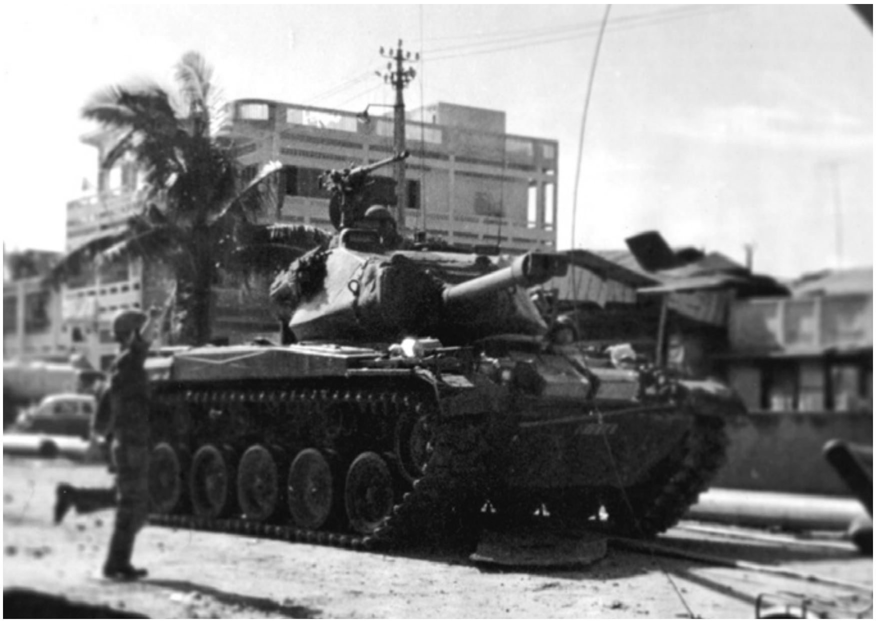
EA-2586

THE STRATEGIC SITUATION

The first clash of M41 and T-54 tanks in Vietnam occurred during Operation *Lam Son 719*, fought between February 8 and March 25, 1971. This operation took place during a crucial transitional period in the history of the Vietnam War. Fighting between North and South Vietnam had been going on nearly since the division of the country in 1954, following the Viet Minh defeat of the French at Dien Bien Phu during March–May 1954 and the issuing of the Geneva Accords resulting from the Geneva Conference of April–July 1954. From 1955 to 1965, a beleaguered South Vietnam had benefited from the materiel and financial support of the United States, while communist North Vietnam received similar backing from the Soviet Union and China, albeit with pockets less deep than those of the Americans.

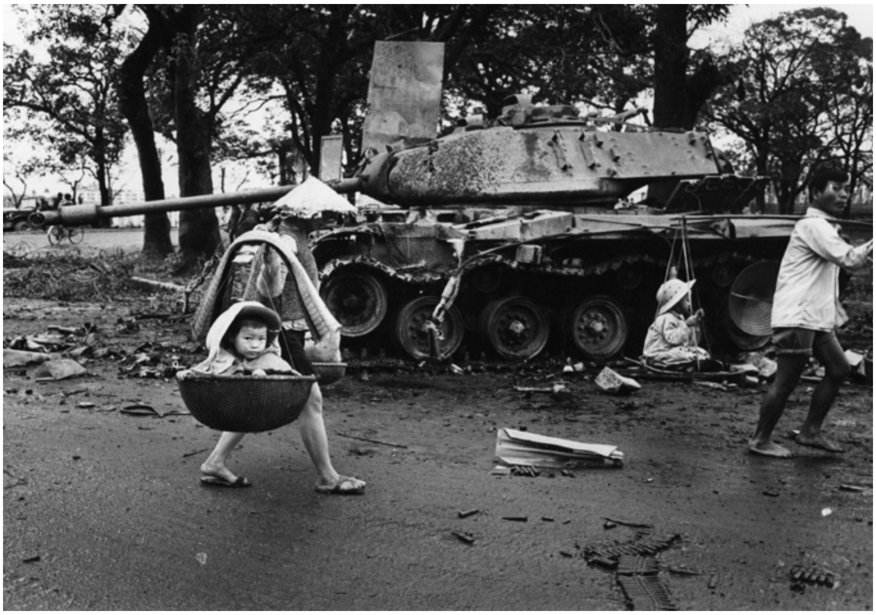
Then, crucially, in 1965 the United States entered the conflict emphatically but controversially as an active combatant, bringing increasingly enormous resources in land, sea, and air warfare. In 1964, by way of illustration, there were just over 23,000 US troops "in-country," operating principally as "advisors" (though the line between advisor and combatant was frequently blurred). By 1968 – the peak year of US deployment – there were 536,000 US troops deployed. This did not mean that the United States took all responsibility for the combat effort, for by this year South Vietnamese military manpower had grown to 820,000.

After the communist Tet Offensive (January–September 1968) and in contrast to escalating public protests in the wider world, there was a certain optimism in the ARVN. The losses suffered by the PAVN and Viet Cong during Tet had been profound, resulting in a noticeable drop in the level and intensity of enemy



An M41A3 advances on an enemy position in Saigon during the Tet Offensive, May 1968. US and ARVN cavalry and mechanized infantry fought several key battles in the northern suburbs and out at Bien Hoa and Long Binh bases. (US Army/Wikimedia/Public Domain)

operations. Following Tet, the United States began searching for an exit strategy from Vietnam, and from 1969, under the presidency of Richard M. Nixon, "Vietnamization" was the guiding policy, and a crucial context to the present study. The essence of Vietnamization was captured in Nixon's statement that "When you are trying to assist another nation defend its freedom, US policy should be to help them fight the war but not to fight the war for them." From 1969, therefore, the United States would progressively reduce its commitment of combat troops, while simultaneously increasing its financial, materiel, and



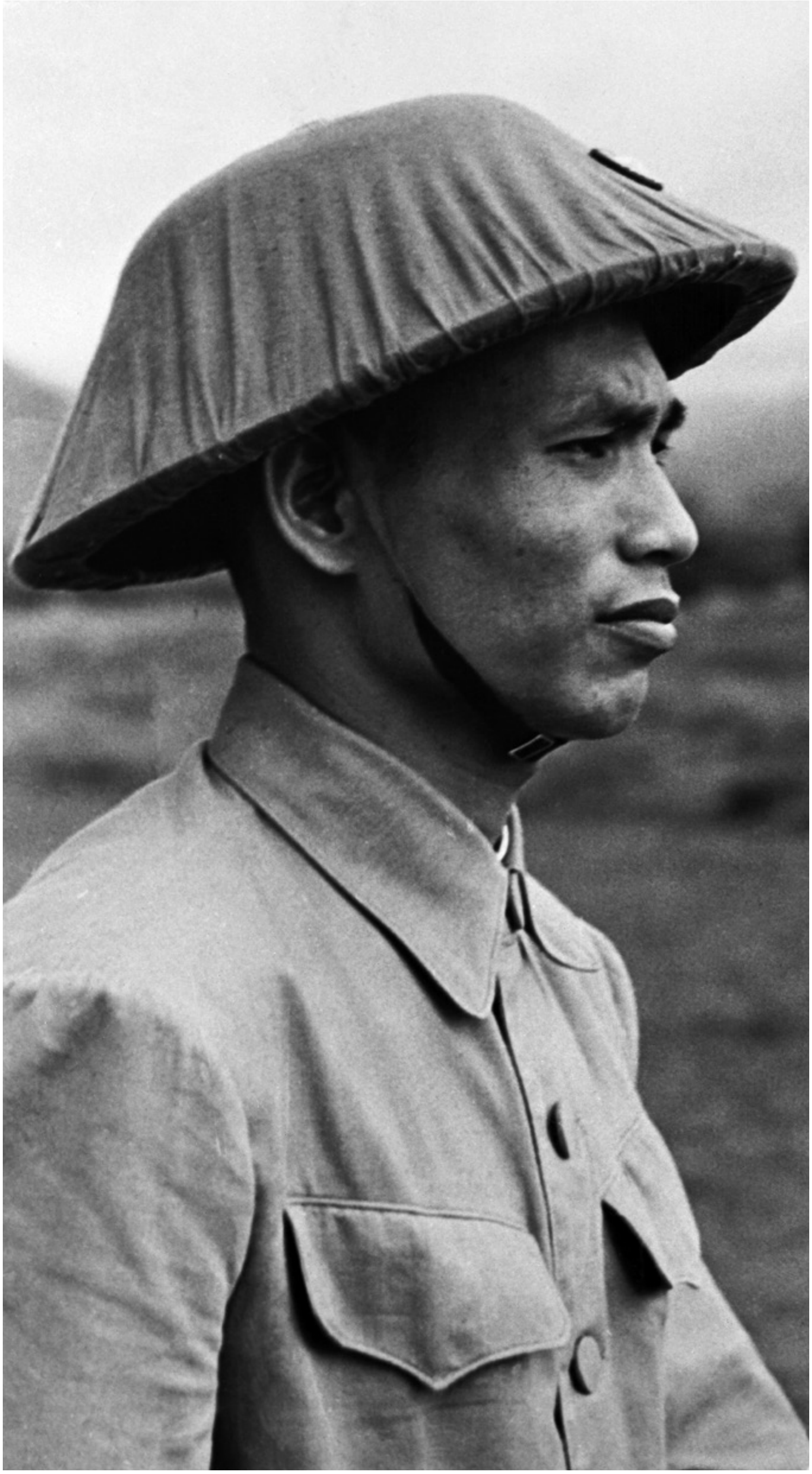
Vietnamese refugees return to Hue after the fighting there in 1968, passing a knocked-out M41A3. The cause of the tank's destruction is unknown, but the urban location of the fighting and the spalling around the turret front suggest an RPG strike. The dangling tow hook might indicate a failed attempt to recover the vehicle. (Terry Fincher/Getty Images)

Hoang Xuan Lam (1928–2017) – depicted here with Lieutenant General Donn J. Robertson, commanding general of III Marine Expeditionary Force, on April 14, 1971 – joined the Army of the Republic of Vietnam in 1950 on an officer's commission, graduating as a lieutenant in 1951. He rose steadily through the ARVN ranks, and spent the years 1953–54 (the years in which the French were defeated by the Viet Minh) abroad studying armored warfare in France. On his return to Vietnam following the issuing of the Geneva Accords on July 21, 1954, Lam became commander of the 1st Cavalry Regiment, later the 1st Armored Cavalry Regiment. In 1959, he attended the Command and General Staff College at Fort Leavenworth, Kansas, while serving as the commanding officer of the Armor Division. In November 1966, with the rank of major general, Lam became the ARVN head of I CTZ, and it was in this capacity that he commanded Operation *Lam Son 719* in February–March 1971. Because of political issues, and controversy over his leadership, Lam left his command in 1972 and served out the rest of the war in the Ministry of Defense. (USMC/Wikimedia/Public Domain)

training support for South Vietnam's armed forces, hoping to raise them to the point of military self-sufficiency. Thus by 1970 US troop levels had dropped to 334,600, and 156,800 by 1971. In the same years South Vietnamese troop numbers climbed to 968,000 and 1,046,250 respectively, and the ARVN received 850,000 small arms, more than 60,000 trucks and trailers, and 5,000 combat vehicles (including tanks) and artillery pieces.

Finding accurate figures for North Vietnamese force strength during the Vietnamization period, and for the volume of support from the Soviet Union and China, is problematic. A US intelligence report estimated the total value of Soviet economic and military aid between 1968 and 1971 as US$2.2 billion, while Chinese aid certainly exceeded US$1 billion. PAVN force levels, despite the massive losses suffered during Tet, were at least equal to those of the South. The North, believing that Vietnamization was weakening its enemy, began to increase its incursions into South Vietnam from Cambodia and Laos, a development that led to the war spilling over into those countries in earnest.

The US–South Vietnamese offensives into Cambodia in April–July 1970 had mostly been a success, destroying six months' worth of enemy supplies. Vietnamization, for all the long-term anxiety it created, was seeing ARVN force strength, in both men and materiel, swell to levels never before achieved. There was still, however, the need for South Vietnam to interdict the cross-border PAVN supply routes on the Ho Chi Minh Trail, which fueled the communist front-line war effort and would certainly act as the launch point for future offensives into the south. In March 1970, the communist-leaning Cambodian king Norodom Sihanouk was ousted in a coup by the head of the Cambodian Army, General Lon Nol, who in contrast to Sihanouk openly leaned toward an alliance with US and South

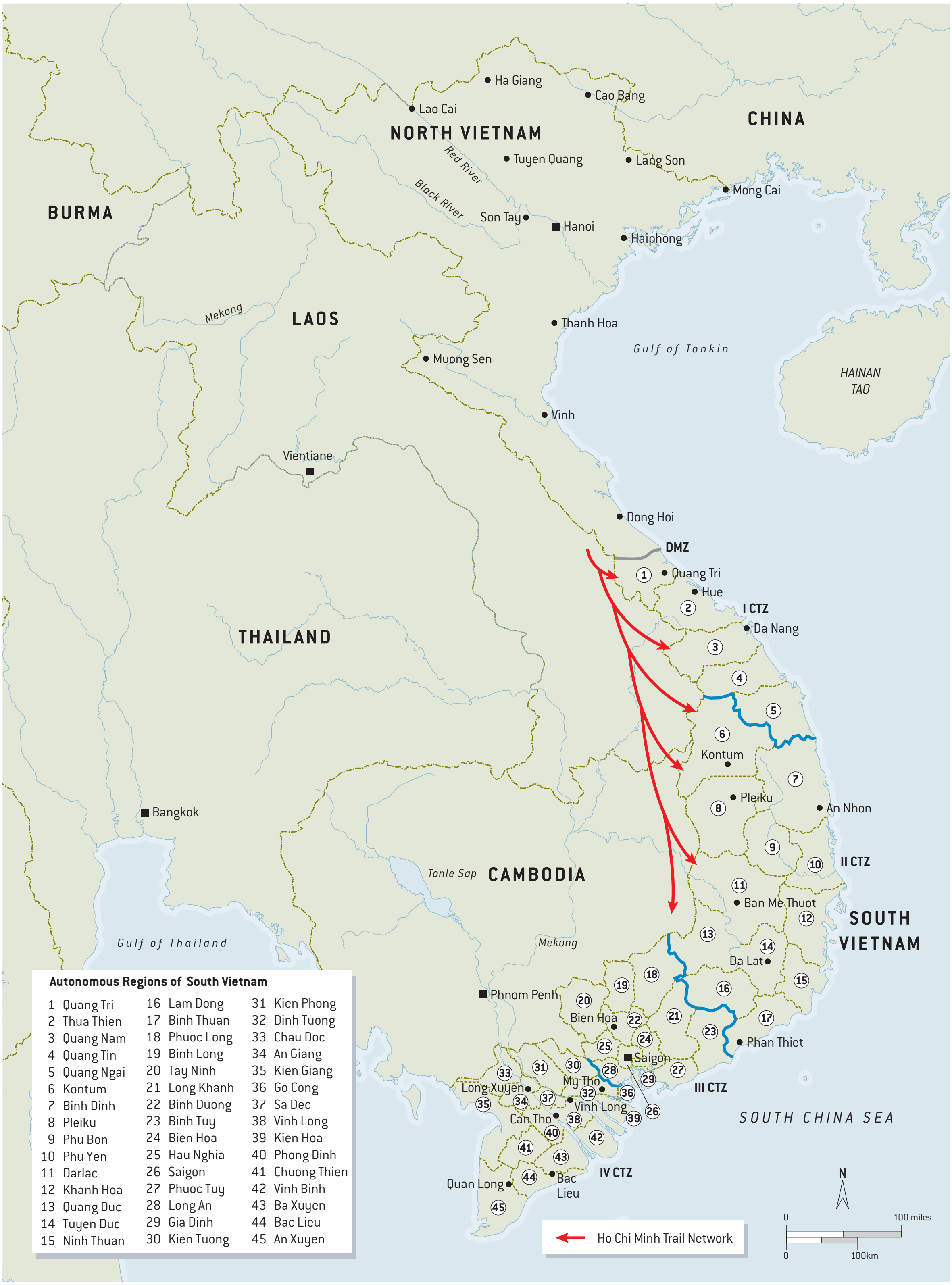


Not an armor commander per se, Van Tien Dung (1917–2002), pictured here on July 11, 1954 during truce talks between the Viet Minh and the French, rose from the humblest of peasant beginnings to become the PAVN's Chief of Staff (1954–74) and Commander in Chief (1974–80), subsequently becoming Vietnam's Minister of Defense (1980–87). Despite having a lack of formal education, Dung rose through the ranks of the PAVN, having joined the Communist Party during the years of French colonization. Dung learned quickly on the job, and eventually achieved a military reputation that was only just behind that of the greatest PAVN commander, Vo Nguyen Giap. Dung played a major role in the leadership of the Easter Offensive in 1972 and of the 1975 Spring Offensive, in which he brought together armor, infantry, and artillery in a final conventional campaign. (Bettmann/Getty Images)

An aerial photograph of two PT-76 amphibious light tanks that were destroyed by US bombers during a failed assault on the US Special Forces camp at Lang Vei, near Khe Sanh, in March 1968. US air power was by far the greatest threat to PAVN armor during the Vietnam War. (Bettmann/Getty Images)

OPPOSITE
South Vietnam was divided into four Corps Tactical Zones (CTZs), redesignated on April 30, 1971 as Military Regions. South Vietnam and North Vietnam shared only a short border, separated by the Demilitarized Zone (DMZ), while the bulk of the county bordered Cambodia and Laos to the west. Through the western parts of both of these countries, North Vietnam cut, built, and maintained the vast supply and infiltration route known collectively as the Ho Chi Minh Trail. A sprawling network of major and minor roads, mostly stringing their way through jungle, wooded, or mountainous terrain, the Ho Chi Minh Trail was punctuated by numerous supply bases, fuel storage depots, maintenance centers, and hospitals, enabling thousands of vehicles and tens of thousands of personnel to pass every year. In the early 1970s, PAVN armored units also moved down the trail to take up offensive positions in both Laos and Cambodia. While the Ho Chi Minh Trail had been bombed relentlessly since 1965, cross-border US and South Vietnamese efforts to sever the trail and destroy PAVN supply bases were the focus of much combat activity in 1970 and 1971, *Lam Son 719* being one of the largest of the operations.

Vietnamese interests. This meant, therefore, that ARVN and US forces had the political space to make military incursions across the western border against the Cambodian portions of the Ho Chi Minh Trail. The effect of these incursions (ignoring here the political outcry against the Nixon administration) was not only that ARVN armor gained some additional practical experience, but also that PAVN traffic increased in the more northerly Laotian sections of the Ho Chi Minh Trail, which were now safer than the Cambodian routes. Recognizing this fact, in early 1971 the ARVN and the US Military Assistance Command, Vietnam (MACV) developed a plan for a cross-border strike into Laos, focusing an advance along Route 9 as far as the important PAVN logistics hub at Tchepone, about 48km from the South Vietnamese border, destroying each PAVN local headquarters and *binh tram* ("troop station," essentially a logistical complex) along the way. The operation was called *Lam Son 719* and would bring the M41A3 into direct combat with the T-54.


CHINA
NORTH VIETNAM
BURMA
LAOS
THAILAND
CAMBODIA
SOUTH VIETNAM
HAINAN TAO
Ha Giang
Cao Bang
Lao Cai
Red River
Black River
Tuyen Quang
Lang Son
Mong Cai
Son Tay
Hanoi
Haiphong
Mekong
Thanh Hoa
Gulf of Tonkin
Muong Sen
Vinh
Vientiane
Dong Hoi
DMZ
Quang Tri
Hue
I CTZ
Da Nang
Kontum
Pleiku
An Nhon
II CTZ
Bangkok
Tonle Sap
Ban Me Thuot
Gulf of Thailand
Mekong
Da Lat
Phnom Penh
Bien Hoa
Phan Thiet
Saigon
Long Xuyen
My Tho
Vinh Long
III CTZ
Can Tho
SOUTH CHINA SEA
IV CTZ
Bac Lieu
Quan Long
N
0
100 miles
0
100km
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45

Autonomous Regions of South Vietnam

1	Quang Tri	16	Lam Dong	31	Kien Phong
2	Thua Thien	17	Binh Thuan	32	Dinh Tuong
3	Quang Nam	18	Phuoc Long	33	Chau Doc
4	Quang Tin	19	Binh Long	34	An Giang
5	Quang Ngai	20	Tay Ninh	35	Kien Giang
6	Kontum	21	Long Khanh	36	Go Cong
7	Binh Dinh	22	Binh Duong	37	Sa Dec
8	Pleiku	23	Binh Tuy	38	Vinh Long
9	Phu Bon	24	Bien Hoa	39	Kien Hoa
10	Phu Yen	25	Hau Nghia	40	Phong Dinh
11	Darlac	26	Saigon	41	Chuong Thien
12	Khanh Hoa	27	Phuoc Tuy	42	Vinh Binh
13	Quang Duc	28	Long An	43	Ba Xuyen
14	Tuyen Duc	29	Gia Dinh	44	Bac Lieu
15	Ninh Thuan	30	Kien Tuong	45	An Xuyen

←	Ho Chi Minh Trail Network

THE COMBATANTS

ARMORED FORCES

ARVN

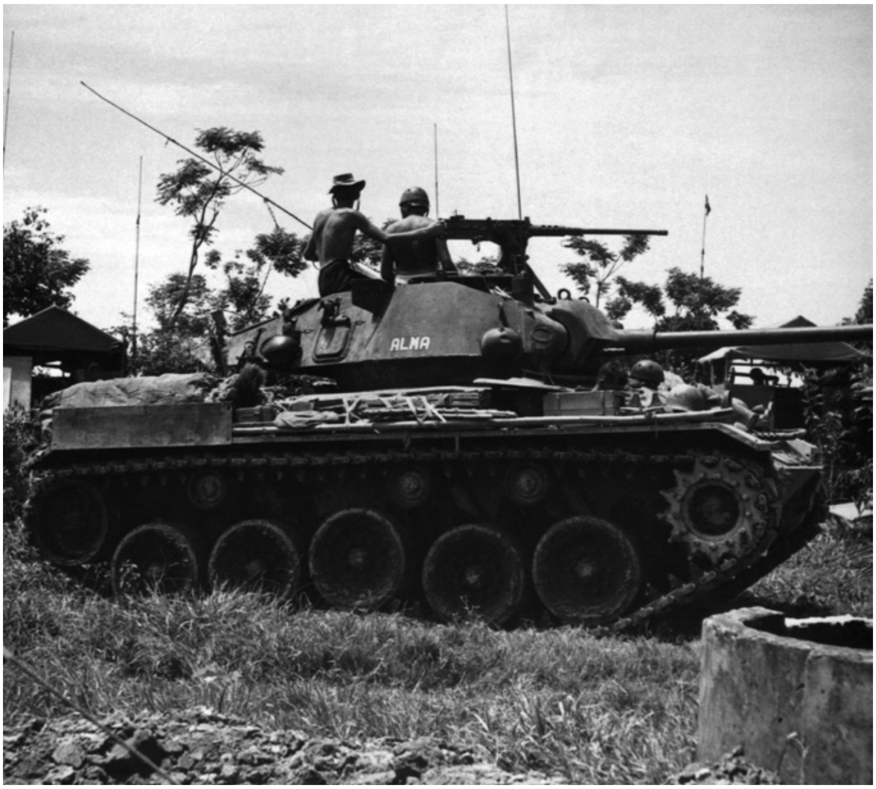
ARVN armored forces originated under French rule. A Vietnamese Armor Branch was established in the early 1950s, consisting largely of mechanized infantry formations rather than tank units. By 1952, the Armor Branch had grown in size to six reconnaissance companies, three of which were evacuated to South Vietnam in 1954 to form the seed of what would become new battalions and regiments. A South Vietnamese Armor Command was formed on April 1, 1955, and an Armor School, dedicated to training ARVN tankers, opened the following month.

At first, ARVN armor consisted primarily of French and US legacy vehicles, principally the M24 Chaffee light tank, M8 Greyhound armored car, M3 half-track, M3 scout car, and M8 howitzer motor carriage. From 1956, however, US materiel and advisory support began to play a more central role in both the structure and equipment of the South Vietnamese armored units, particularly with the heavy supply of the new M113 APC from 1962. Armor was organized into armored cavalry regiments (ACRs), with the focus heavily upon M113-equipped mechanized companies (later mechanized rifle squadrons). By 1963, each ACR had five troops, one of which was a tank troop of M24 Chaffees. In 1964, authorization came for these tanks to be replaced by M41A3 Walker Bulldogs, a process implemented from 1965.

By December 1965, the ARVN Armor Branch included eight ACRs, incorporating five M41A3 troops (each of 17 tanks), 21 M113 armored cavalry troops, three M8 reconnaissance troops, and one 4.2in mortar-equipped M106 APC platoon. Further

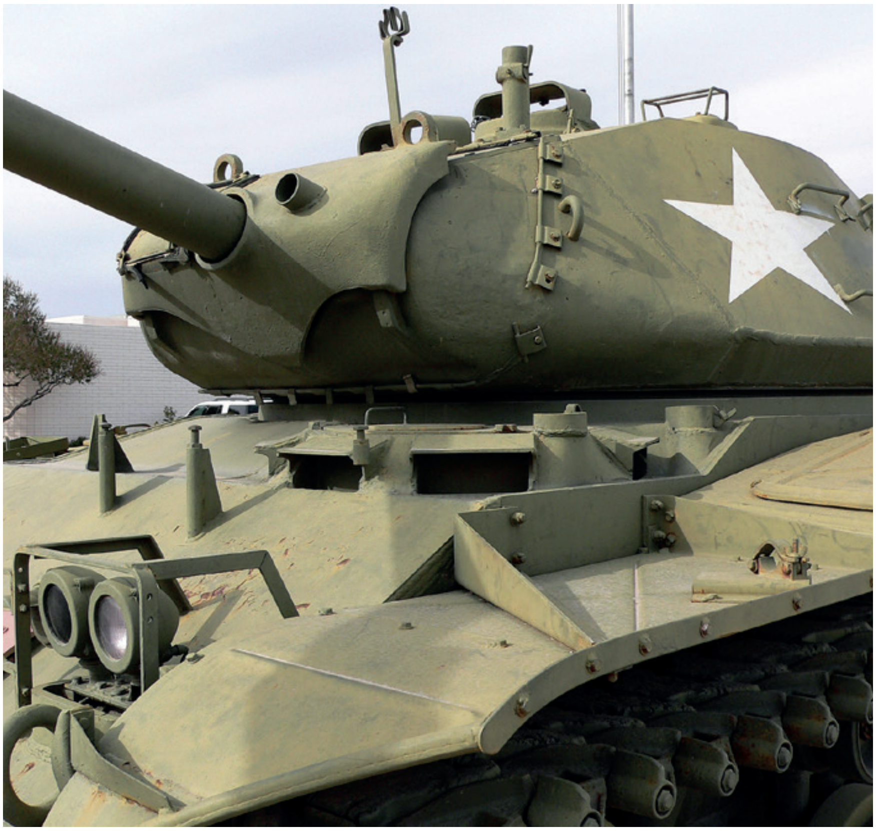
ARVN armor assets in the early 1970s		
CTZ	**Armor units assigned**	**Brigade**
I	4 × M41 armored cavalry squadrons (4th, 7th, 11th, 17th) 1 × M48 tank squadron (20th)	1st Armored Brigade
II	4 × M41 armored cavalry squadrons (3d, 8th, 14th, 19th) 1 × M48 tank squadron (21st)	2d Armored Brigade
III	5 × M41 armored cavalry squadrons (1st, 5th, 10th, 15th, 18th) 1 × M48 tank squadron (22d)	3d Armored Brigade
IV	5 × M41 armored cavalry squadrons (2d, 6th, 9th, 12th, 16th)	4th Armored Brigade

expansion came quickly, and under a new system of terminology the ACR was redesignated the armored cavalry squadron (ACS) at the end of 1967. By late 1968 there were 11 such units, with seven more under formation. Also in the late 1960s, the armored cavalry squadrons were grouped into new armor brigades, with each Corps Tactical Zone (CTZ) being allocated a brigade-strength force. Not only did these brigades include M41A3s, but also new squadrons of M48A3 Patton MBTs, more than equal to the T-54. Working on the basis of each ACS having one M41A3 troop of 17 tanks, the figures in the table on this page suggest a total force of 306 Walker Bulldogs, a considerable weight of armor when added to the M48s and other armored vehicles.



In 1965 the M41A3 replaced the M24 Chaffee, shown here, as the light tank of ARVN cavalry units. The M24 was developed in the last years of World War II, and was a replacement for the Light Tank M5 (Stuart). The M24 was extensively used by the French during the Indochina War; this tank was photographed in Vietnam in 1954. (© CORBIS/Corbis via Getty Images)

The front turret and hull of the M41 Walker Bulldog. The cylindrical aperture in the mantlet is for the .30-caliber M1919A4E1 coaxial machine gun. Note also the two types of headlamp; the closer headlamp is the standard night headlamp, while the one nearer the centreline of the tank is the blackout headlamp. (Stan Shebs/ Wikimedia/CC BY-SA 3.0)

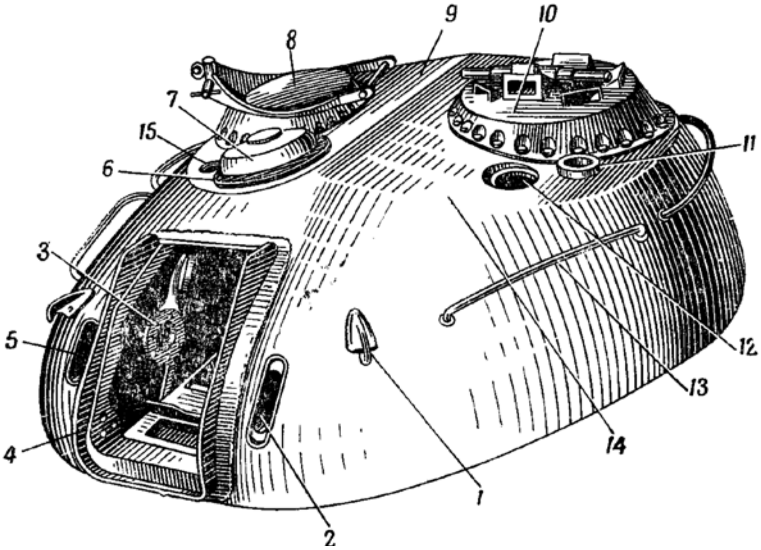


PAVN

Like the ARVN, the PAVN's armored history began with the division of the country in 1954. The PAVN's first armored unit was a company of M8 armored cars and M3 half-tracks, established in 1956, but in October 1959 it founded its first full-fledged tank unit, the 202d Armored Regiment, equipped with Soviet T-34/85 tanks and SU-76 self-propelled guns. By 1964, the 202d Armored Regiment had grown to three battalions in strength, one of which was now equipped with T-54 tanks.

Up to 1965, the PAVN's doctrinal position on the use of armor was relatively limited, focused mainly on the localized support of infantry forces. (In many ways, this was also true of the ARVN.) In 1965, however, the PAVN formed an Armored Forces Directorate, and subsequently armor adopted a more proactive role within the PAVN's battle strategies, especially in the use of multiple tanks in coordinated attack strategies. Thus in 1967 and 1968 PAVN tanks (largely PT-76s) were used in several significant offensive engagements, operating mainly from bases just across the border of South Vietnam in Laos.

By the beginning of 1971, US intelligence agencies estimated that the PAVN had a total of about 50 T-54s in its arsenal, plus 300 PT-76s and 50 T-34/85s. The numbers grew substantially and quickly, through Soviet and Chinese supply routes. Indeed, by the time of the Easter Offensive in 1972 the PAVN fielded 350 T-54s or Type 59s, with PAVN official sources claiming that more tanks had been added to the army in early 1972 than in the whole of the 1965–71 period.



The T-54 turret, as it appeared in its classic configuration. The feature labeled “7” is a mushroom-shaped dome vent, to give the crew an open source of fresh air. This was deleted in the T-55 with the installation of the Nuclear, Biological, Chemical (NBC) package, which required the tank to be sealed against outside pollutants. (Author)

Prior to and during Operation *Lam Son 719*, the principal PAVN tank formation was the 202d Armored Regiment, plus some independent tank battalions and companies. Following that operation, the armored formations increased in number and scale prodigiously, the 202d soon being joined by the 201st, 203d, and 207th Armored regiments, with a total of 16 tank battalions within them. There was also some restructuring within the regiments. Typically, each PAVN armored regiment had three battalions: two tank battalions, each of 38 tanks, and one APC battalion. Each battalion in turn had three companies, all with the same vehicles, although on occasions the companies could have mixed types. For example, the 195th Tank Battalion had two companies equipped with Type 59s and one company of T-34/85s. After Operation *Lam Son 719* there was some reorganization of the regiments and their supporting structure. For example, the 202d Armored Regiment was converted into a mechanized formation consisting of two tank battalions (one of T-54s and the other of T-34/85s) and two mechanized battalions, while the 203d Armored Regiment was upgraded to four battalions of tanks, all T-54s or Type 59s (Grandolini 2015a). Many independent mechanized APC companies were also established and attached to larger infantry or armored formations.

T-54 and T-55 tanks gather round the Parliament buildings in Budapest during suppression of the Hungarian Revolution of October–November 1956. Soviet armor doctrine favored mass formations of armor, operating preferably over the open terrain of Central Europe, but in PAVN hands the tanks were mainly used in small numbers for infantry support. (Jack Esten/ Picture Post/Getty Images)

ARMOR CREWS

We have built up a reasonably substantial picture of the PAVN and ARVN armored combat units available in the early 1970s. What this picture cannot provide, however, is an insight into the difference those inside the tanks could make to the outcome of a battle.

Understanding the ARVN and PAVN crews who operated the M41A3s and T-54s is not a matter entirely divorced from ideology, politics, and wider strategic contexts. While there was certainly a core body of practical and operational knowledge that each crew member needed to acquire, the efficiency with which this knowledge was absorbed and expressed could vary greatly according to circumstances. Morale and retrograde tactical outlooks could, as we shall see, undo much training. Yet one tendency to guard against is to portray ARVN forces as universally corrupt, and incompetent, and PAVN forces as tactically crude but ideologically fanatical. Although both the ARVN and PAVN armored forces had their fair share of problems, issues that had serious impact on the life and survivability of crews, they also had many excellent commanders, proficient and courageous men, and a huge amount of combat experience. Also, unlike the soldiers of many US outfits, who had a fixed one-year tour of duty, Vietnamese soldiers would often serve for multiple years without a break, building up substantial combat experience in the process.

ARVN

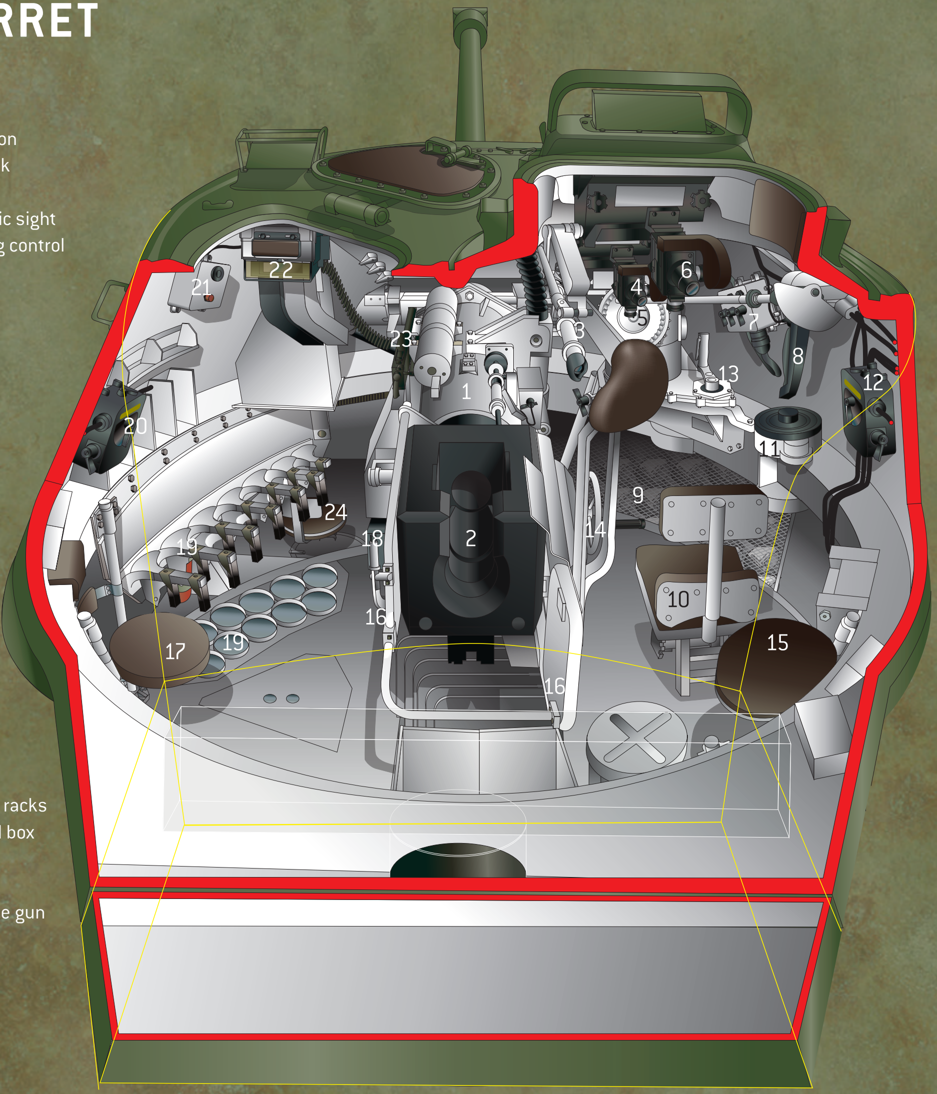
Understanding the ARVN soldier as a military professional is inseparable from the relationship between South Vietnam and its sponsor, supporter, and co-combatant, the United States. Between 1957 and 1959, 16 US Army advisors were attached as armor advisors to the Military Assistance Advisory Group, Vietnam (MAAGV). General Donn A. Starry, a former armor commander and advisor in Vietnam, noted that despite the operational experience mechanized units were gaining, the contribution armor was making was largely ignored by the US military as whole, and thereby neglected. Yet from 1962, and the formation of MACV, the way in which ARVN forces developed, including the armor units, was inextricably linked to US doctrine and advisors, who increased in number and quality. Each ARVN armor unit received a small advisory detachment.

The job of the advisors was often a trying one, as they attempted to surmount cultural, linguistic, and political barriers, while also struggling to represent their role to higher US military authorities, which could be disdainful of ARVN efforts. Yet most advisors grew to respect the ARVN armor crews, and developed meaningful dialogues with them. Starry makes an important point about the general impression the ARVN armor crews made on the US advisors:

> Most armor advisers were impressed by the technical proficiency of their Vietnamese units. In the maintenance of weapons and equipment, the Vietnamese armor crewman was outstanding; his innovations often extended to making repairs with chewing gum, bailing wire, and even banana stalks. In tactics and the coordination of fire support, South Vietnamese armored units had much to learn in the early years from American advisers. The exchange of information between adviser and unit gave a better understanding of Vietnam's particular problems and was indirectly useful in helping to prepare American units for service in Vietnam. (Starry 1978: 21)

M41A3 TURRET

1. 76mm M32A1 rifled cannon
2. 76mm M32A1 breechblock
3. M97 telescopic sight
4. Gunner's M20A1 telescopic sight
5. Gunner's power-traversing control handwheel
6. Commander's M20A1 telescopic sight
7. Turret control box
8. Commander's power control handle
9. Forward 76mm ammunition rack
10. Gunner's seat
11. M31 azimuth indicator
12. Gunner's C375 VRC control box
13. Gunner's traversing hand drive handle
14. Gunner's elevation handwheel
15. Commander's seat
16. Breechblock shields
17. Loader's seat
18. Breech operating lever
19. 76mm ammunition ready racks
20. Loader's C375 VRC control box
21. Loader's safety switch
22. Loader's M17 periscope
23. 30-caliber coaxial machine gun
24. Driver's seat



Here we see the interior of the M41A3 Walker Bulldog. The vehicle had four crew positions: tank commander, gunner, loader, and driver.

The commander was positioned in the upper level of the turret on the right, with the option of either standing on the turret-floor platform (to look out of the turret hatch) or sitting in the commander's seat. There he had access to the radio sets on the back of the turret wall, plus his M20 periscope sight and gun controls.

Set just in front and below the commander was the gunner, with a seat on the right side of the tank. The gunner also had the M20 periscope sight plus the M97 periscope, and all the gun controls, both manual and powered.

The loader, meanwhile, was on the left-hand side of the turret. He could either stand on the turret floor (the typical position when he was loading the gun) or sit on the loader's seat. A ready rack of seven rounds stood just in front of him, and further ammunition was stored in racks in the hull and the turret. In front of the loader was his M13 periscope.

Finally, the driver was located down in the front of the hull, on the left-hand side, on his driver's seat, with his driving controls in front of him and vision provided by a basic periscope and vision blocks.

What became important for the ARVN armor forces was to develop a proper doctrinal understanding of what they were meant to do. This was not easy for several reasons. First, in the early days of US deployment at least, US armor advisors largely imported lessons derived from the experience of Korea, a very different theater from Vietnam in both terrain and tactics. There was often a difference in outlook in terms of using armor for offense and defense, the Americans generally preferring the former, the ARVN leaning toward the latter. The reasons for this ARVN predilection are complex, and include poor and over-centralized command structures, the latter extending from the office of the Chief of Armor, which technically had no tactical authority but often ended up giving direct orders to field units (Starry 1978: 17).

Many of these problems were wholly or partially overcome by an improvement in the quality of training. ARVN tank-crew training was modeled squarely on the instruction provided at the US Army Armor School at Fort Knox, Kentucky. This was natural, to an extent, given that the ARVN crews mostly manned US-made armored vehicles and read straight-up translations of US field manuals. There was also a lively program of sending ARVN armor officers to the United States for additional training. Indeed, between 1956 and 1972, a total of 712 Vietnamese officers undertook training at Fort Knox.

Within South Vietnam, the principal center for training all ARVN armor crews was the Armor School at Thu Duc. Here the crews received both basic and advanced training in all aspects of armor operation and vehicle handling, plus tactical combat procedures. An important training facility for the Armor School was the tank gunnery range at Trang Bom. Before the opening of this range on December 13, 1969, the ARVN tank crews had to travel some distance to access US- and Australian-run firing ranges, but the location of the Trang Bom range – just 40km from the Armor School – meant that more time could be spent in live-fire training, an investment that would be more than repaid on the battlefields of the 1970s.

In action, ARVN M41 crews were required to follow the strictures of the US Army's FM 17-80 *Tanks, 76-mm Gun M41 and M41A1 Walker Bulldog Technical Manual*:

> A tank crew must be drilled in the performance of their firing duties to insure coordination of effort and speed of execution. Gun drill is conducted in the form of nonfiring exercises against both stationary and moving targets. Speed must be emphasized throughout this phase of drill. Periods of gun drill must be periodically scheduled and conducted in order to maintain a high standard of tank crew proficiency. To stimulate interest, the tank should move a few yards between each nonfiring exercise, preferably over a simulated combat course in which there are various types of targets that become visible as the tank advances along the course. For the moving target phase of gun drill, a target mounted on a 1/4-ton truck can be used. The speed and direction of travel of the target or target vehicle should be varied. (Department of the Army 1956: 87)

The different responsibilities of the various members of the M41 crew were set out in FM 17-80. The tank commander had to be "alert for targets. Control operation of tank by interphone. Give fire commands and lay tank gun for direction. Observe fire and give subsequent fire commands if necessary. If gunner is unable to see target, adjust fire. Fire turret-mounted caliber .50 machinegun as necessary," while the gunner was required to "Observe in assigned sector. Index range on ballistic unit corresponding

ARVN tank crews familiarize themselves with the M41A3 during a training exercise. No date is given in the photograph, but it is likely around 1965, when the M41A3s were first introduced into ARVN service. (US Army/Wikimedia/Public Domain)

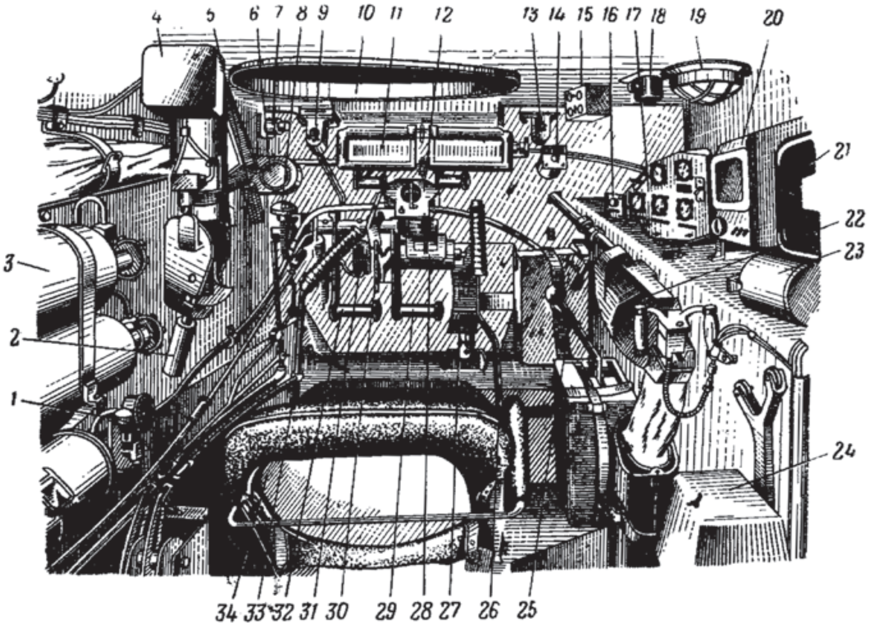
to announced ammunition. Lay tank gun for deflection and elevation. Fire on target. Adjust fire for target destruction. Announce MISFIRE if tank fails to fire and STOPPAGE if coaxial machine gun fails to fire." The driver was to "Observe terrain for best routes. Avoid unnecessary obstacles. Be alert for commands from the tank commander. Observe in assigned sector," while the loader was trained to "Observe in assigned sector. Load ammunition as announced in fire command. Press loader's reset safety on tanks so equipped. Announce UP. Continue to load until CEASE FIRE is announced. Follow correct procedure in event of misfire or stoppage. Fire coaxial machinegun manually when directed by gunner. Refill ready racks when necessary. Keep record of ammunition fired" (Department of the Army 1956: 87–88).

There is no doubt that there were some systemic problems at the heart of the ARVN in general, including the Armor Command. The quality of officers could be extremely variable, with some appointments being subject to political nepotism, producing a faction of officers more self-interested than combat focused. A US report from 1969 noted that "The quality of unit [armor] training varies widely and is influenced above all by the local commander's interest and emphasis" (Andreacchio 1969: 19). There was also the issue that in-unit training was frequently neglected, either through apathy or on account of the existing pressures of combat on the units. ARVN armored units were meant to go through regular refresher training to update their skills and share their experience, but often they could not be released from front-line duties because of operational need. The consequence of this was a certain ossification of skills and drop in morale, especially later when compounded by reductions in US financial investment in the ARVN. Desertion was also an endemic issue, especially during times of severe combat or financial pressure on the lower ranks. Given the scale of losses among ARVN tank crews, the desire to flee and survive another day was understandable.

Against this negative backdrop, however, there is no doubt that by the early 1970s the ARVN had produced a body of well-trained armor personnel to man its M41A3s. While Basic Combat Training involved 288 hours of training over six weeks, Armor Advanced Individual Training fitted 216 hours of training into four weeks; the 15-week Officer Candidate School course involved 862 hours of training, including 308 hours on tactics, while the Armor Basic Officer's Course encompassed 576 hours overall: 95 hours of general training, 236 hours of specialized training, 186 hours of tactical training, and 59 hours of tests and commander's time (Andreacchio 1969: 23–24). There was little wrong with the nature of the ARVN armor training programs, which were comprehensive in terms of subject coverage and allocated reasonable hours of study. What US intelligence reports noted, however, was that the quality of the training imparted depended very much on the quality of the commanding officer, and how much investment he made in post-qualification unit training. Many crews consequently had to learn their combat skills on the job, with all the costs that entailed. Some of the less effective unit commanders also had a tendency to lose their leadership and direction during the heat of battle, especially if it looked like the fight was turning against them. When a battle was going in their favor, the ARVN armor units often carried with them momentum and discipline, but if the odds shifted against them a setback could turn into a bloody rout.

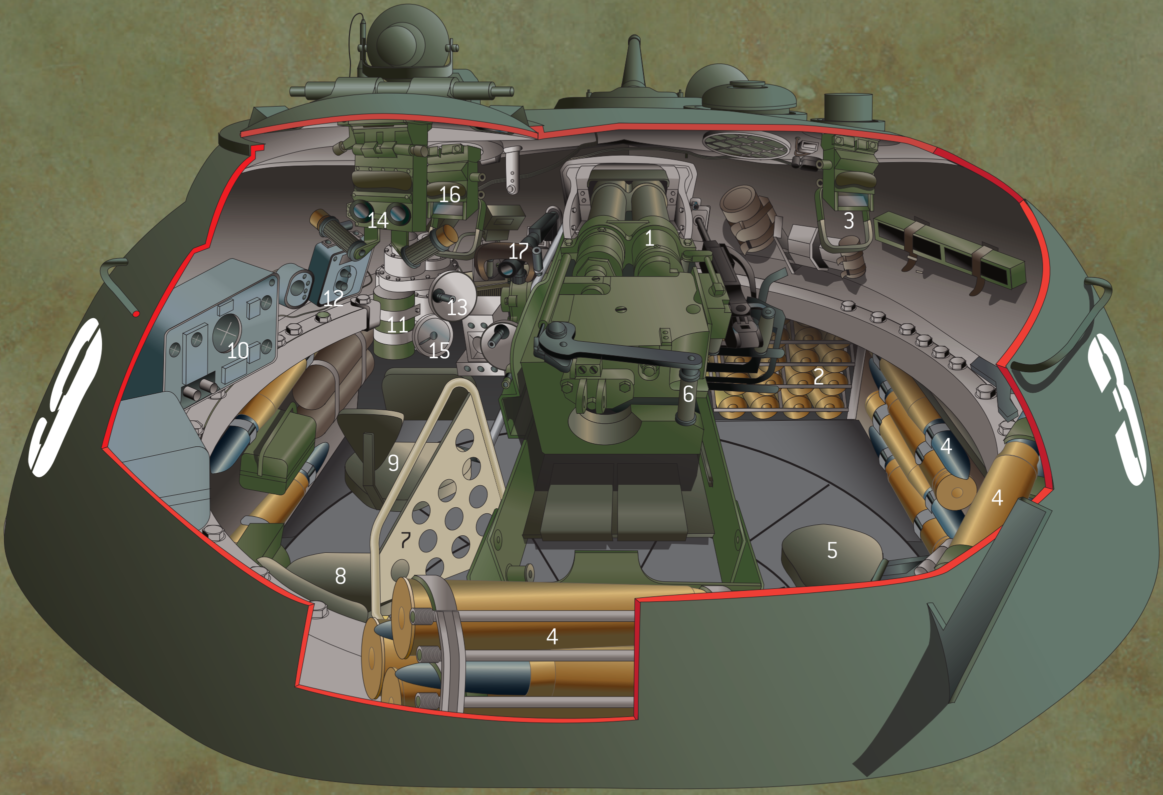
PAVN

In contrast to the doctrines of the US military, the PAVN armor forces – like the PAVN in general – were the recipients of Soviet-style tactical training, merged with some elements of Maoist revolutionary warfare. The Soviet influence over armor thinking was explicit at the very formation of the PAVN's 202d Armored Regiment, which was built upon the expertise of *c.*200 students who had received instruction in armored warfare in the Soviet Union and China. In some respects, however, the early training of PAVN armored troops was as much focused upon the tactics of antitank warfare as it was upon actual armor operations. The limited numbers of tanks available for combat operations meant that the mass armor offensives advocated by the Soviets were not an option for the PAVN; terrain conditions alone in Vietnam largely prevented such operations, although as we shall see armor was used in greater mass during the final years of the war. Furthermore, with the entry of US combat forces into the conflict in 1965, the PAVN armored units also had to contend with the responsive predations of US strike aircraft, which took a heavy toll on PAVN armor during the conflict. These conditions altered



The T-54's driver position, with his two vision blocks visible at the top of the image. Note also the 7.62mm coaxial machine gun positioned to his right. The box-like structure over the gun's receiver was a tin case deflector, to prevent the driver being hit by spent cartridge cases when the machine gun was fired. (Author)

T-54B TURRET



1. D-10T2S 100mm gun
2. 100mm main ammunition storage
3. Mk 4 periscope
4. 100mm ammunition ready racks
5. Loader's seat
6. D-10T2S 100mm gun breech operating handle
7. Shoulder guard (to protect commander from recoiling breech)
8. Commander's seat
9. Gunner's seat
10. R113 radio transceiver set
11. Turret rotation drive
12. Intercom system
13. Turret traverse wheel
14. TPKU-2B binocular periscope (for commander)
15. Turret rotation indicator
16. 1× periscope (for gunner)
17. Gunner's TSh2B-32P telescopic sight

The T-54B interior was a tight one for the four-man crew, with limited space for movement and for the storage of equipment and ammunition. Nevertheless, the tradeoff for this cramped interior was the tank's low profile. The interior layout was a near-reverse of that of the M41A3.

The commander was on the left side of the turret at the top, and had the relative luxury of a padded seat with equally padded backrest and headrest. A shoulder guard to his right protected him from the recoiling gun breech, although this also limited his room to move, so it was a feature often removed. The main instrument in front of him here is the TPKU-2B binocular periscope, which featured a target-designation system.

The gunner was in the position in front of and below the commander, and here he has the TSh2B-32P telescopic sight, which worked in sympathy with the STP-1 single-plane gun stabilizer.

The loader was on the opposite side of the turret to the commander, with ready racks just behind the breech and on the turret wall by the side of the loader's seat. The loader would also have access to the 7.62mm SGMT coaxial machine gun positioned just to the right of the main-gun breech, fed from a 250-round box magazine.

The driver's station was at the front left of the hull. Steering was performed with a pair of tiller levers; on the right-hand steering tiller there was also a solenoid thumb trigger to operate the hull-mounted machine gun. Note that this machine gun was in a fixed position, so aiming the weapon was restricted to nothing more sophisticated than pointing the tank in the general direction of the enemy.

the training focus, and in November 1972 a US intelligence document (MACV 1972) identified three main tactics pursued by PAVN armor.

The first was area defense. In this configuration, the tanks largely occupied static defensive positions on the front line (with a small number held farther back as a reserve), set in either hull or turret defilade positions. (In hull defilade, only the hull of the tank is protected by an earthen rampart in front of the tank, allowing the gun to fire with the hull remaining in a protected position. In turret defilade, the entire tank is concealed behind the rampart up to the roof of the turret, allowing the tank commander to observe over the top of the rampart, but not fire over it.) If the PAVN tank crews were expecting assaults by enemy armor, they would generally try to remain hidden from view until the opponents were within 200m range, both to avoid revealing their positions and to increase the possibility of a first-round hit.

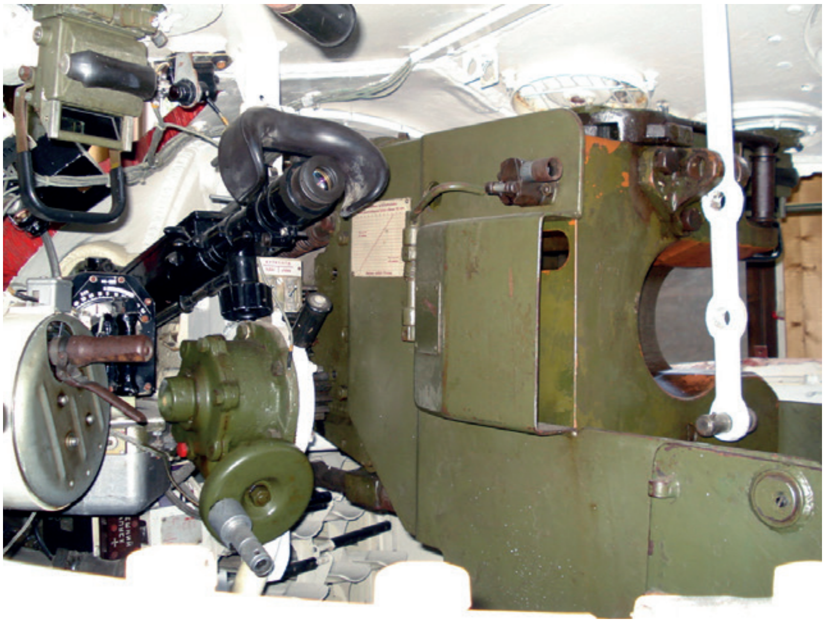
The second tactic was mobile defense. In this type of defense, a small number of tanks (2–5 per infantry regiment) were positioned forward of the front line in defilade, ready to engage an advancing enemy and draw in his forces. Once the enemy was revealed in full, then the majority of the tanks and infantry, which had been held back behind the front line in concealed positions, would attack in force to effect destruction upon the enemy.

The third tactic was the offensive. In a pure offensive role, the tanks would be backed by regimental-size infantry forces as a minimum, to ensure full infantry support for the attack, plus major artillery assets to deliver preparatory bombardments. Following the artillery's softening-up of the enemy positions, the tanks would then surge forward, typically carrying tank-killer infantry teams on their hull and turret, ready to deploy them when enemy threats emerged. At the same time, reconnaissance teams would continually adjust the supporting artillery fire, shifting its focus to the enemy rear areas once the tanks had reached the opposing front lines.

One interesting point noted by the US intelligence document was that "As soon as the objective had been consolidated, the tanks move to pre-selected concealed positions to reduce their vulnerability to enemy air and artillery" (MACV 1972: 3). Much like the German tank crews in France during the second half of 1944, the PAVN tankers must have spent much of their time anxiously scanning the skies for roving US attack aircraft. Indeed, a large component of PAVN armor training was the practice of vehicle camouflage, the PAVN tankers demonstrating all manner of ingenuity with foliage, building materials, and proximate natural cover in hiding their vehicles.

What is also apparent from this description is the *theoretical* priority – not always reflected in reality – placed upon armor–infantry cooperation, the infantry being essential for suppressing the enemy infantry's antitank capabilities. This was also a pressing issue for the ARVN as well, and following the Tet Offensive combined-arms instruction and exercises took a more prominent role in South Vietnamese training programs.

The ARVN and PAVN armor crews worked in very different cultural contexts to each other. In the ARVN, the front-line command structures tended to be a looser, slightly more chaotic version of the decentralized US command model. In the PAVN, by contrast, authority was more centralized and rigid, with less room for individual initiative or innovative commanders. This type of organization could be highly vulnerable on fluid, mobile battlefields when armor forces were split into smaller packets by the flow of action.



The gunner's station in a T-54 training tank. The optical instrument by the side of the gun breech is the TSh-20 telescopic sight, which eliminated the problem of the Mk 4 periscope by having a fixed eyepiece and telescope body that did not move with the gun. (Balcer~commonswiki/ Wikimedia/CC BY-SA 3.0)

In terms of crew training, the basic PAVN armor crewman's course lasted a respectable ten months, with officers and NCOs taking an additional ten months of instruction to fulfil their leadership roles. The 1972 US intelligence document, however, made an important observation: "Little of what is taught is actually practiced at the [armor] school, however, presumably owing to POL [Petroleum, Oils, and Lubricants] and munitions shortages, so that school trained crews often fire their first rounds in battle. Battlefield support between armor and supporting infantry apparently suffers significantly from this failure to rehearse these techniques prior to actual battlefield application" (MACV 1972: 2). Certainly, there seems to have been a big gap between PAVN armor doctrine and the experience of battle.

The PAVN authorities were cognizant of the problems in their armored operations. The lessons learned from Operation *Lam Son 719*, although encouraging in some respects, nevertheless highlighted key deficiencies in crew training and capabilities, deficiencies that needed substantial rectification if the impending Easter Offensive of 1972 was to reap its full dividends, and if the rapid influx of new tanks from China and the Soviet Union was to bear tactical fruit. Levels of recruitment to PAVN tank crews were increased dramatically, but with the key difference that now the Armor Command was given the best in terms of high school, university, and Communist Cadre School graduates. The training program was intensified but shortened, with the basic armor training now lasting three months, although there were further specialist training courses that added another 6–9 months. In total, 724 officer and 233 technical cadres graduated in 1972 (Grandolini 2015a). There was actually a problem with the new recruitment policy, however, in that it made the classic mistake of equating formal intellectual qualifications with potential skill-at-arms. Consequently, low-ranking men of humble training, but who nevertheless had both intellect and combat experience, might be overlooked for command positions in favor of individuals who looked good on paper and had impeccable political credentials.

ARVN and PAVN tank crews had very different contexts to their military service. What they shared, however, was that they both served in armies that were attempting to learn the ropes of armored warfare, and in a conflict and on terrain that was often ill-suited to the operation of heavy armor. The results of this mutual learning curve would be expressed on the battlefields of South Vietnam and Laos in 1971–75.

COMBAT

OPERATION *LAM SON 719*

THE PLAN

Operation *Lam Son 719* was broken down into four main phases. Phase I was the American part of the operation, designated *Dewey Canyon II* by the US forces. It involved US infantry, airborne troops, and armor opening up Route 9 to the Laotian border, establishing advanced logistical bases to support the ARVN, and providing cover for the forward deployment and also the later withdrawal of ARVN units. The US troops would also reoccupy and rehabilitate the old Khe Sanh base, which had been evacuated after Tet, this base then offering a logistical anchor for the ARVN mission. Note that in terms of the land campaign, the US troops would stop clean at the border between Laos and South Vietnam. Within Laos itself, Operation *Lam Son 719* was going to be primarily an ARVN action, albeit with the heavy and critical support of US air transportation and strike aircraft support, plus the long-range capabilities of US artillery. Notwithstanding this support, Operation *Lam Son 719* would largely be a test of the newly "Vietnamized" ARVN.

In Phase II, the ARVN's 1st Armor Brigade (Colonel Nguyen Trong Luat), which included the M41A3 tanks of the 11th and 17th Armored Cavalry squadrons and ARVN engineer units, would advance over the border and straight west along Route 9. At the same time, ARVN Rangers, airborne troops, and airmobile infantry would be heli-lifted forward to key objectives either side of the highway, establishing fire support bases (FSBs) and blocking positions to protect the road-bound task force. The 1st Armor Brigade, once it reached forward airborne troops at Aloui (geographical name Ban Dong), was to keep advancing west to Tchepone, linking up there with the 3d Airborne Brigade.

OPPOSITE
An ARVN M41A3 prepares to roll into action. Note how the vegetation camouflage applied to the top of the turret obscures the silhouette against the background. (Larry Burrows/The LIFE Picture Collection/Getty Images)

A convoy of M41A3s moves into Laos along Route 9 during Operation *Lam Son 719*, each tank festooned with ammunition boxes, camouflage, and troops taking a ride. (Christopher Jensen/Getty Images)

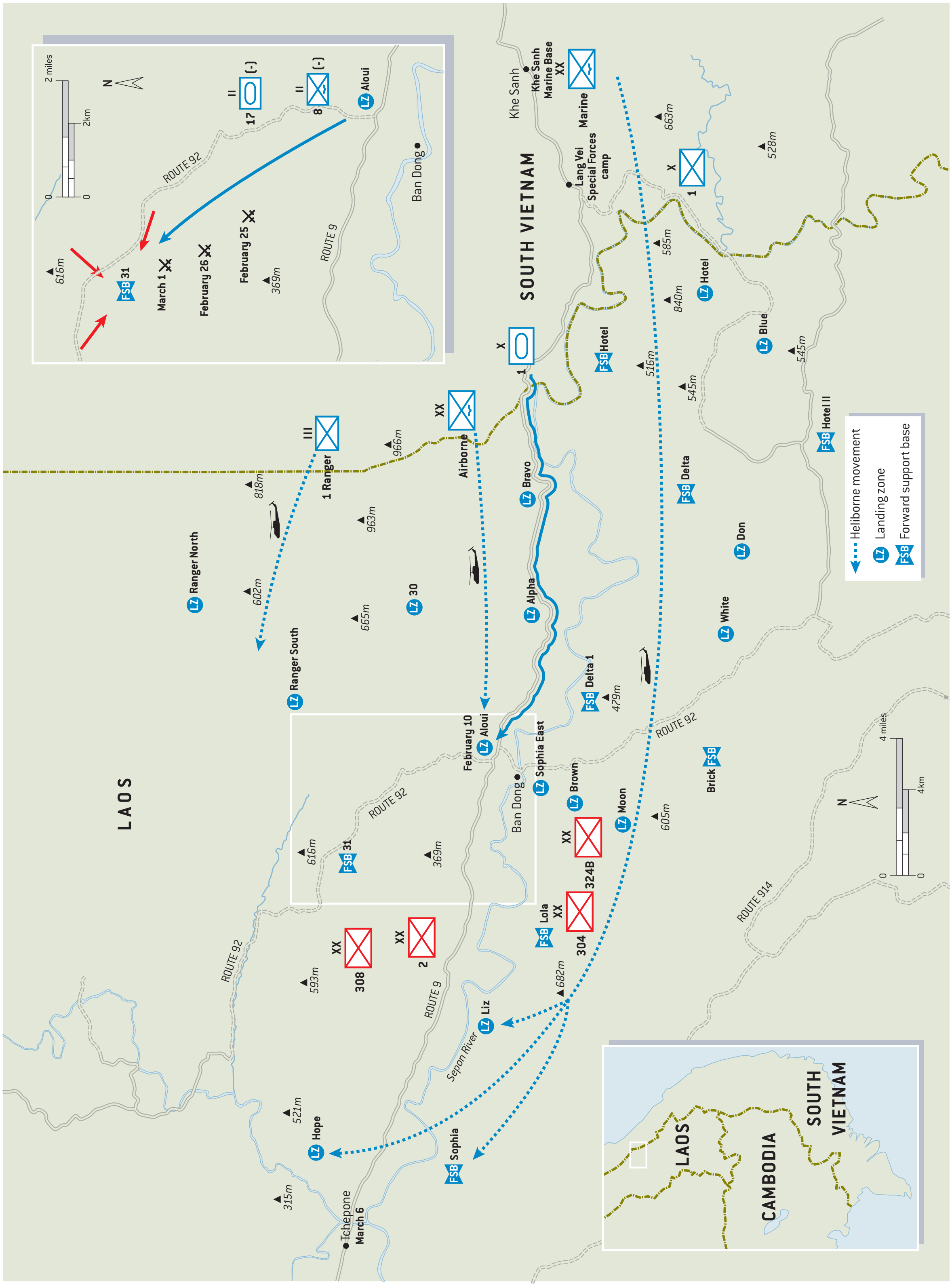
In Phase III, the task force and airborne troops at Tchepone would conduct aggressive actions in the region to destroy enemy bases and cut lines of communication in all directions. Once the maximum effect had been achieved, then would come Phase IV, an ordered withdrawal back to and across the South Vietnamese border, the 1st Armor Brigade again taking Route 9 back to Khe Sanh, which would be secured by US troops.

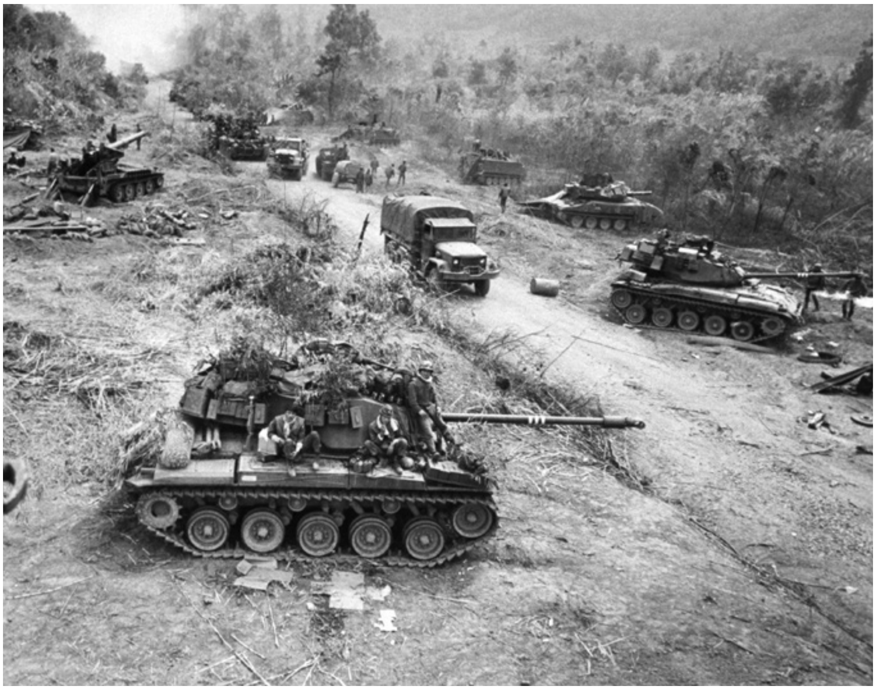
For the ARVN armored forces, there was much risk implicit in the Operation *Lam Son 719* plan. For a start, both their advance and withdrawal would flow along a single, narrow highway, bordered by many stretches of high ground with plenty of cover and concealment for enemy forces. If the flanking support from airmobile operations were compromised, then the tanks and APCs would find themselves very exposed to ambushes and counterfire. Second, the ARVN M41A3 contingent was actually very small: together the 11th and 17th Armored Cavalry squadrons brought with them fewer than 17 tanks; even with later reinforcements the weight of armor was limited. Then there was the matter of enemy strength. Later in the battle, a PAVN sergeant was captured, and under questioning he revealed that the PAVN had been expecting an ARVN Laotian offensive for many months (operational secrecy among ARVN units was extremely poor), and that a new corps-size headquarters, the 70th Front, had been established to counter the threat. This front included three infantry divisions (304th, 308th, and 320th), artillery units, and – crucially – an armored regiment, equipped with T-54 and PT-76 tanks (Nguyen Duy Hinh 1979: 82). Importantly, both the PAVN infantry and armor crews also had familiarity with the terrain in eastern Laos, unlike the ARVN tankers crossing the border.

INTO ACTION

Dewey Canyon II was launched on January 30, 1971. Over the next week, the US forces cleared Route 9 on the Vietnamese side and re-opened the Khe Sanh base,

OPPOSITE
Operation *Lam Son 719*.


LAOS
SOUTH VIETNAM
Khe Sanh
Khe Sanh Marine Base
XX
Marine
Lang Vei Special Forces camp
X
1
663m
528m
585m
840m
LZ Hotel
LZ Blue
545m
FSB Hotel
516m
545m
FSB Hotel II
FSB Delta
LZ Don
LZ White
FSB Delta 1
479m
ROUTE 92
FSB Brick
605m
LZ Moon
LZ Brown
LZ Sophia East
Ban Dong
February 10
LZ Aloui
XX
Airborne
LZ Bravo
LZ Alpha
III
1 Ranger
966m
818m
963m
LZ Ranger North
602m
665m
LZ 30
LZ Ranger South
616m
FSB 31
369m
ROUTE 92
XX
324B
XX
304
FSB Lola
682m
XX
308
XX
2
593m
ROUTE 92
ROUTE 9
LZ Liz
Sepon River
521m
LZ Hope
FSB Sophia
315m
Tchepone
March 6
ROUTE 914
N
0
4 miles
0
4km
Heliborne movement
LZ Landing zone
FSB Forward support base
LAOS
CAMBODIA
SOUTH VIETNAM
2 miles
2km
0
0
N
II
17
(-)
II
8
(-)
LZ Aloui
ROUTE 92
Ban Dong
ROUTE 9
616m
FSB 31
March 1
February 26
February 25
369m



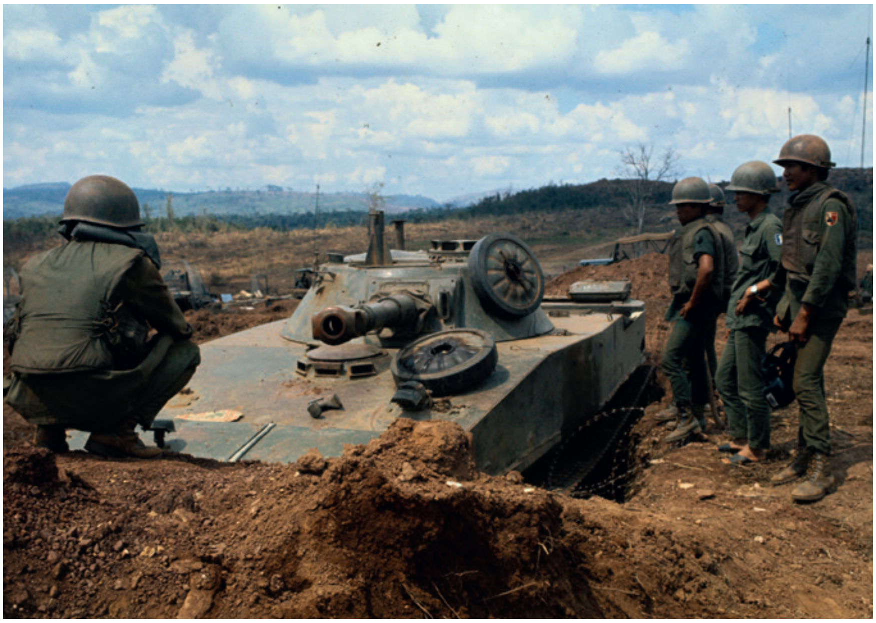
M41A3 tanks gather ready for Operation *Lam Son 719* in early February 1971, in the company of field artillery (an M107 175mm self-propelled gun is in the left background) and, in the right background, M113-borne mechanized infantry. Note how the tank in the foreground has been used to carry extra machine-gun ammunition boxes. (Larry Burrows/The LIFE Picture Collection/Getty Images)

experiencing little resistance in the process. Then at 1000hrs on February 8, the 1st Armor Brigade rumbled across the Laotian border heading west, while hundreds of helicopters flew farther down the line to establish the FSBs and occupy key objectives. Operation *Lam Son 719* had begun.

For the armored force, Phase I of Operation *Lam Son 719* was initially encouraging. Although some resistance was encountered, much of the heavier fighting occurred in the vicinity of the airborne landings, and Aloui was reached on February 10. The airborne troops had successfully established the FSBs in the area. Furthermore, the US and South Vietnamese air support provided something of a protective corridor to the armored advance; up to 900 US combat sorties were being flown every day, mostly by helicopter gunships but also by fixed-wing aircraft, including some punishing B-52 Stratofortress "Arc Light" bombing raids.

There were some troubling signs developing, however. The weather was worsening, further degrading a road that was already, in parts, little more than a dirt track. Resistance was strengthening on a daily basis as PAVN units converged on Route 9, with the result that the task force became largely stalled at Aloui for more than a week. PAVN antiaircraft artillery was also increasing in terms of the numbers of gun barrels and the volume of fire, meaning that air cover became more perilous to provide. The FSBs began to wilt under enveloping attacks, and the ARVN commanders now began to debate the wisdom of progressing farther west.

A key moment in the offensive came on February 25. Even as FSB Ranger South was being abandoned due to PAVN pressure, FSB 31, just to the north of Aloui, was assaulted by a combined-arms action of PAVN tanks (including T-54s) and infantry and was overrun. In response, a task force from the 17th ACS, led by Colonel Nguyen Xuan Dung, plus five M41A3s assigned from the 1st Tank Troop, 11th ACS,



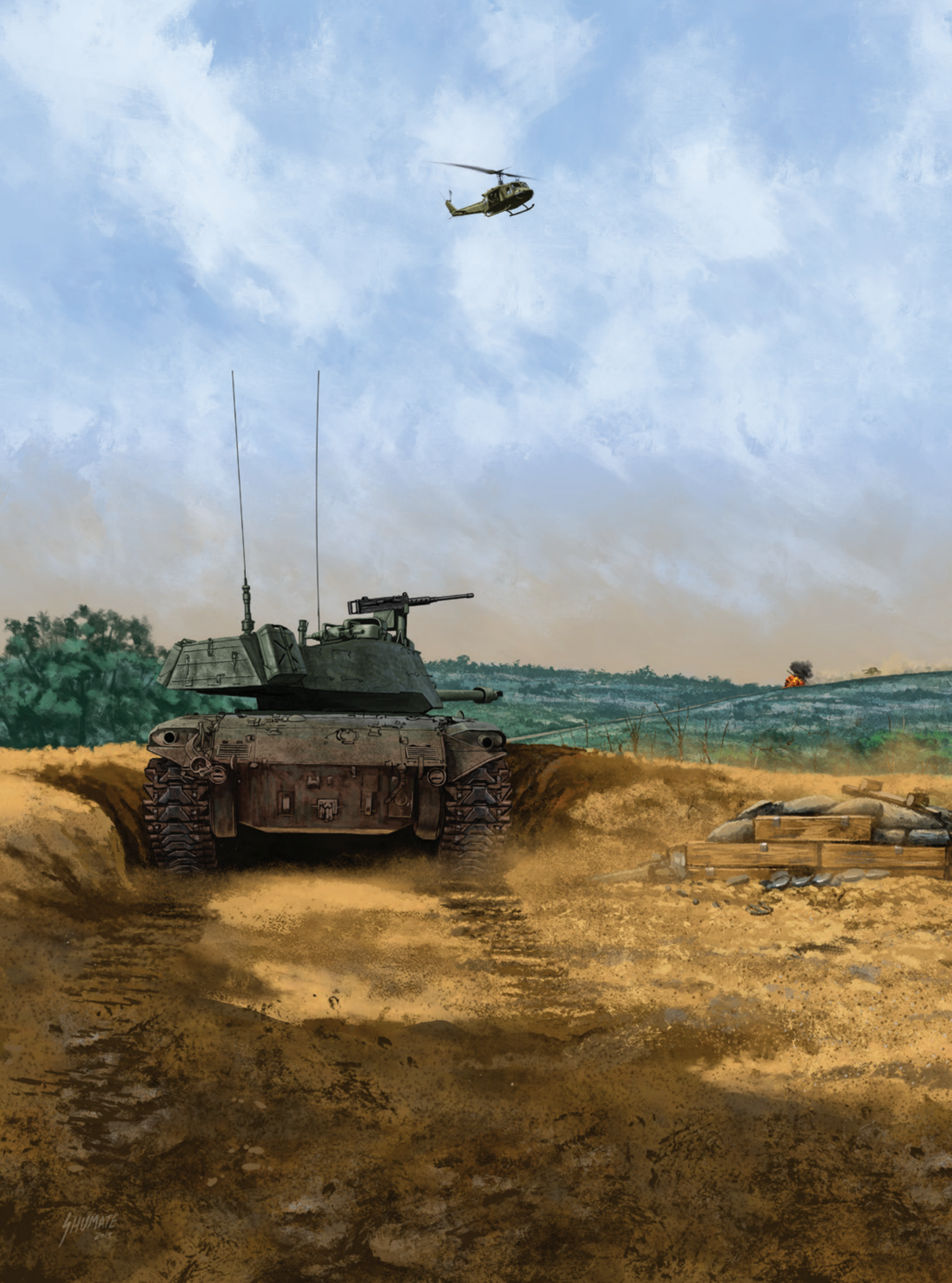
ARVN soldiers inspect a disabled PT-76 tank, captured during cross-border operations in 1971. The PT-76 was a light tank like the Walker Bulldog, but it had a fully amphibious capability – very useful in the watery flatlands of Southeast Asia – and could achieve a speed of 10.2km/h in swimming mode. (Bettmann/Getty Images)

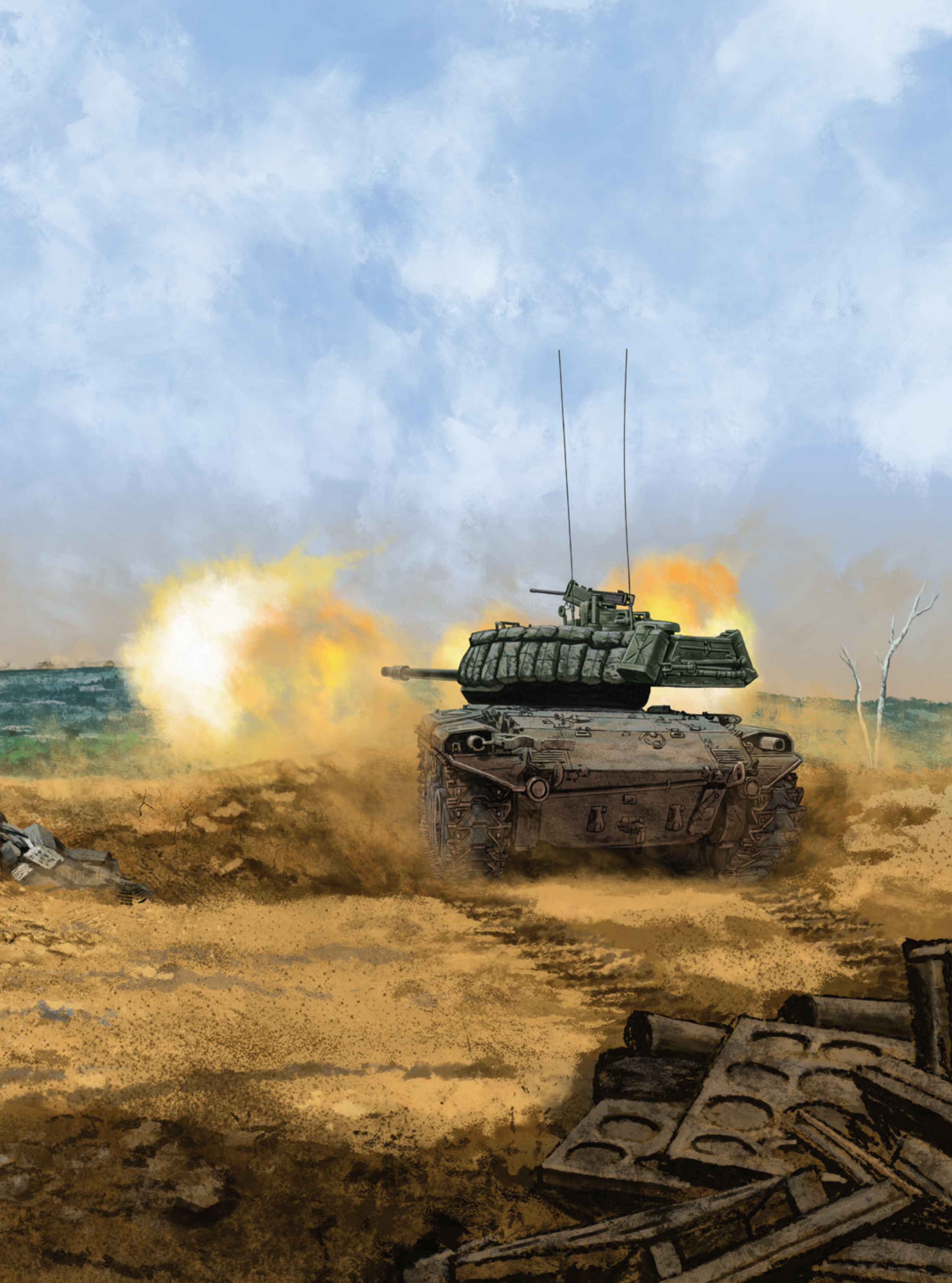
supported by two airborne companies, was ordered north to go and relieve FSB 31, the order later changed to retaking the base as events unfolded. Note that there is some divergence in the sources here. Starry (1978: 192–93) states that the armored relief force was ordered north on February 18, fighting a battle with PAVN tanks on February 19 *before* FSB 31 was overrun. Yet both Nguyen Duy Hinh and Ha Mai Viet state that the order came through on the 25th, recording no action on the 19th. On account of Hinh and Ha being ARVN veterans of the conflict, with detailed notes regarding the sequence of events, this account will follow theirs.

During the advance toward FSB 31, the ARVN armored force was ambushed by two PAVN PT-76 tanks, which knocked out one M113 APC. The M41A3s responded quickly, counterattacking and disabling and capturing one of the PT-76s. Pushing on, the ARVN force reached and occupied a hill adjacent to FSB 31 on February 26, and set up defensive positions. Early the following morning, in some confusion over the status of the firebase, the tanks fired yellow identifying smoke into the opposite FSB. The response was the emergence of a sudden threat – a company of T-54 tanks advancing in aggressive formation. This was the moment when M41s and T-54s first encountered each other on the Vietnamese battlefield. In an astonishing display of gunnery, the ARVN tankers wiped out the entire PAVN attack, for the cost of just one man killed.

This was not the end of the ARVN tankers' victories, however. Around 1300hrs another five PAVN tanks made an assault upon the ARVN positions, and once again all five were destroyed. Another engagement between 1400hrs and 1500hrs resulted in the final destruction of the PAVN armor on FSB 31.

The ARVN units could not resist indefinitely, however, and they withdrew to Route 9. Yet despite the growing pressure on the mission, Operation *Lam Son 719* continued forward, and Tchepone was reached by ARVN airborne troops on March 6. After the ARVN forces there destroyed or took whatever enemy supplies they could,


SHUMATE
2019



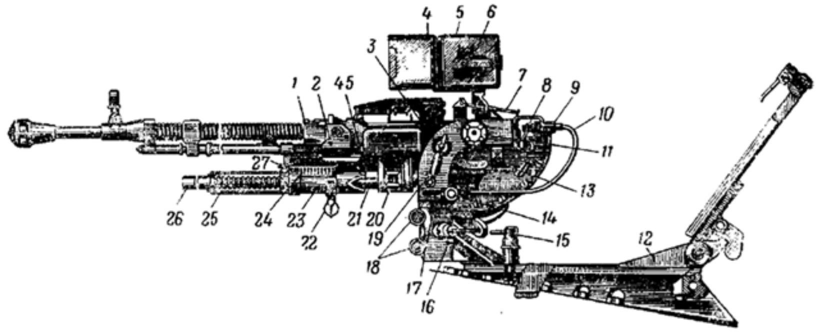
PREVIOUS PAGES
The engagement around FSB 31 on February 27, 1971 saw ARVN M41A3 crews demonstrate the superiority of training over mere weight of armor. Hill 31 had been captured by PAVN forces the previous day, although the status of the firebase there was not confirmed until the morning of the 27th. Five M41A3 tanks from the 17th ACS had taken up position on an adjacent hill, having reached the position at 1700hrs the day before. Shortly after the unit received confirmation that the position had been captured, five T-54 tanks were observed moving along the hilltop toward the ARVN tanks' position, as the PAVN forces launched a strike from FSB 31. The commander of the ARVN unit, Lieutenant Colonel Xuan Dung, immediately responded, and ordered his gunner to engage the lead PAVN tank. The first shot was a triumph – it smashed through the lower armor of the T-54 (possibly striking the fuel tank under the belly), at which point the tank blew up with such ferocity that it flipped over on its back. The other M41A3s then engaged the remaining targets, hitting them consistently until all the enemy vehicles were destroyed by 1100hrs. It was an astonishing feat of gunnery by the ARVN crews, and this significant engagement cost them just one casualty – a vehicle commander was killed in the exchange of fire. The dug-in positions of the M41A3s helped them to ride out any return fire.

it was time for a general withdrawal before the enemy reinforcements already flowing into Laos could reach critical mass. Indeed, by the beginning of March PAVN armor strength in the sector had swelled to two tank battalions, and even though the 1st Armor Brigade was now being reinforced by piecemeal armored units from across the border, the buildup was still unequal.

BACK TO THE BORDER

The 1st Armor Brigade remained at positions around Aloui while ARVN infantry forces began their withdrawal, but the ARVN tankers were finally given the order to retreat on March 19, with the 11th ACS acting as the rearguard (Starry 1978: 195). The withdrawal stage of Operation *Lam Son 719* turned what had been a promising incursion into a frantic rout. As PAVN forces swarmed around the retreating ARVN units, command and control often broke down, resulting in tactical confusion and heavy casualties. For the M41A3 crews, and all of the 1st Armor Brigade, the problems were now made worse by the absence of air cover, diverted elsewhere on the battlefield. There were scenes of utter chaos. In one incident, two M41A3s were abandoned in the middle of the stream crossing, blocking the withdrawal of the 11th ACS; by the time they had partially cleared the obstruction and crossed the river, 17 of the unit's vehicles had been knocked out or abandoned. The beleaguered 11th ACS was subsequently ambushed, resulting in the destruction of four M41A3s and 13 M113s. In an attempt to avoid the now-exposed Route 9, 5km from the border the ARVN armor now went off-road along jungle trails, where many of the vehicles were destroyed by close-in PAVN antiarmor teams, or suffered mechanical breakdown. Such was the panic of the flight that after crossing the Sepon River near the border, aerial reconnaissance photographs revealed that 22 M41A3s had been abandoned, plus 54 M113s.

Photographed in 2002, a destroyed M41A3 lies in a field near the former DMZ at the Khe Sanh combat base. (David Greedy/Getty Images)

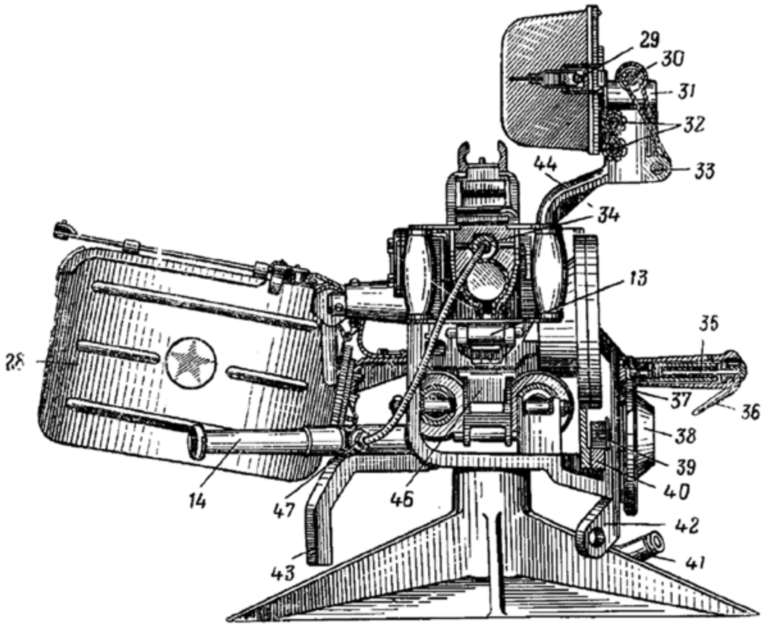


LEFT AND BELOW

The 12.7mm DShKM machine gun was fitted as standard to most T-54 turrets, providing both antiaircraft and infantry defense. It was fitted with an ammunition box that held 60 12.7×108mm cartridges. With one box fitted, and four more boxes stored by the loader's position inside the turret, total ammunition capacity for the machine gun was 300 rounds. (Author)

REGROUP AND RETRAIN

Operation *Lam Son 719* officially ended on April 6, 1971, by which time the 1st Armor Brigade had lost about 60 percent of its armor. For the surviving M41A3 crews, the aftermath of the mission must have elicited a range of emotions and lessons. On the one hand, they had demonstrated that their light tanks were, when operated by crews trained in superior gunnery techniques, quite capable of wiping out PAVN units equipped with the T-54, despite the latter tank's more powerful gun and far heavier armor. The PAVN armor authorities were suddenly very aware that massing armor on the battlefield was not a guarantee of victory. The T-54 crews seemed slow in target acquisition, and unimaginative in maneuver. In fairness, they also had to deal with the terrible poundings from US strike aircraft and helicopter gunships, which actually claimed the lion's share of the PAVN armor destroyed during the mission. In total, the PAVN lost 106 tanks – T-54s, PT-76s, and T-34s – during Operation *Lam Son 719* and during the few tank vs. tank duels they were utterly outclassed, apparently demonstrating the worth of the US-oriented training in countering the



Soviet doctrine. Other PAVN losses included 291 trucks, 116,000 tonnes of ammunition, 1.3 million drums of gasoline, and 13,000 dead.

Even so, the dire experience of the withdrawal tempered any ARVN euphoria about the operation. A total of 54 M41A3s had been destroyed by the time the last ARVN armored units crossed into the relative sanctuary of South Vietnam. Although some of these were likely destroyed by T-54s (information on this point is unclear), most were accounted for by PAVN infantry antitank teams, armed with RPGs or recoilless rifles, or from artillery fire. Another portion of the loss could also be attributed to the vehicles becoming immobilized or breaking down in difficult terrain.

In the aftermath of Operation *Lam Son 719*, both sides reflected on the lessons of battle. For ARVN and PAVN tank crews alike, 1971–72 saw increasing levels of recruitment, training investment, and also the receipt of new batches of vehicles, increasing the front-line strength of armored forces. For the South Vietnamese, one of the most significant investments was in the creation of the 20th Tank Squadron with its M48A3 tanks, giving the ARVN Armor Branch a substantial contingent of heavier armor, equivalent to the muscle of the T-54 tanks that were becoming increasingly prevalent on the battlefield.

THE EASTER OFFENSIVE

The next major confrontation between PAVN T-54s (and Type 59s) and ARVN M41A3s came on March 30, 1972, in what was the start of what became known as the "Easter Offensive." This was the North Vietnamese attempt, almost as ambitious as 1968's Tet Offensive, to overwhelm three of South Vietnam's four military regions (MR I, MR II, and MR III), in a huge land-grab from the Demilitarized Zone (DMZ) in the far north down to Tay Ninh just to the northwest of Saigon. What made the invasion notable was the central role that PAVN armor played in the attacks. Now T-54s, Type 59s, PT-76s, and T-34s were fully committed at the forefront of the infantry assaults as lead elements. What remained to be seen was whether the tanks had been

PAVN armored forces deployed in the Easter Offensive 1972

201st Armored Regiment (171A, 171B, 297th Armored battalions)
202d Mechanized Regiment (198th and 397th Armored battalions; 66th and 244th Mechanized regiments)
203d Armored Regiment (3d, 4th, 512th Armored battalions)
195th Armored Battalion
6th Armored Battalion
20th Armored Battalion
21st Armored Battalion
10th Armor School (Training Armor and 177th Armor battalions)
12 independent armored companies
510th Armored Anti-Aircraft Group

ARVN soldiers make the victory sign atop an M48A3 tank as they take up position along Route 1 near Tay Ninh. The M48 Patton was the principal US Army and Marine Corps main battle tank during the Vietnam War. It had a 90mm M41 gun and its maximum armor thickness (on the turret front) was 178mm. (Bettmann/Getty Images)

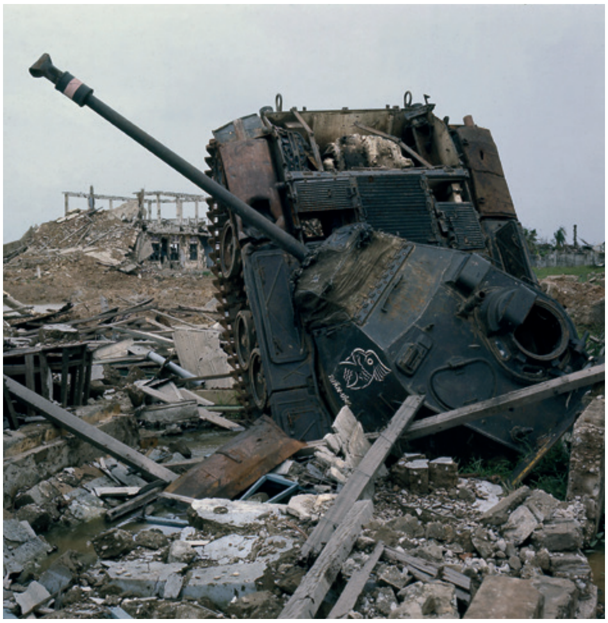
more intelligently integrated into combined-arms operations, working cooperatively with infantry and artillery, or whether tactical shortcomings would reveal themselves.

The Easter Offensive was a vast and sprawling military operation that lasted until October 22, 1972, and space and thematic focus do not permit the full details of its unfolding here, nor of all the armor operations that occurred. Instead this study gives the broad brushstrokes of events in each of the three military regions, punctuated by closer studies of individual M41 vs. T-54 actions that illustrate key points of tactical employment.

THE FIGHTING IN MR I

The most potent of the PAVN thrusts into South Vietnam was made in MR I, directly across the DMZ and the northwestern borders, led by three infantry divisions and more than 150 tanks, the principal focus being on taking the provincial capital, Quang Tri. The bulk of the opposing ARVN armor was fielded by the 1st Armor Brigade, with four squadrons of M41A3s and M113s, but there was also the welcome backing of the 44 M48 Pattons of the 20th Tank Squadron.

After a thunderous preparatory artillery bombardment, the PAVN forces surged across the South Vietnamese border from the west and the north on March 30, the western push including tanks of the 397th Armored Battalion and the assault over the DMZ fronted by the 4th Armored Battalion. From the north, the line of advance followed Route 1, which ran toward and through Dong Ha on a southeasterly direction and ultimately reached Quang Tri, while from the north the momentum was along the east–west Route 9, heading toward Cam Lo and also reaching Dong Ha farther east.



In this particularly striking image, an ARVN M41A3 lies utterly wrecked on the Quang Tri battlefield during the Easter Offensive of 1972. (Kanus/ullstein bild via Getty Images)

During these first dramatic phases of the Easter Offensive, it was the M48A3 Pattons, not the M41A3 Walker Bulldogs, that managed to hold out against the surging PAVN armor. In the first clash of M48s and T-54s around Dong Ha on April 2, M48s wiped out nine PT-76s and two T-54s at ranges of up to 3,000m; the PAVN tank crews seemed unable even to acquire the enemy visually at these ranges, let along engage him. The M48s managed to stop the T-54s literally in their tracks, and did so again west of Dong Ha on April 9, when M48s knocked out 16 T-54s and one Type 59 in a single day. When M41s came up against the massed T-54s, by contrast, there seemed little repeat of the light tanks' attrition imposed during Operation *Lam Son 719*. The M41A3s of the 11th ACS were roughly handled as the PAVN armor forced a river crossing at Cam Lo, the squadron losing an entire troop to the PAVN guns. Nevertheless, ARVN forces managed to establish and hold a defensive line along the Mieu Giang and Cua Viet rivers, the 1st Armor Brigade now boosted by the M41s of the 18th Armored Cavalry Squadron, transferred in from MR III. The South Vietnamese even launched a counteroffensive, Operation *Quang Trung 729*, on April 9, but the PAVN halted this by April 24. Losses among the M41 tanks were by this point reaching critical levels, not only due to combat but also as a result of problems with supply and maintenance. On April 25 a total of 37 M41s and M48s were destroyed, some by the new Soviet 9M14 Malyutka (AT-3 "Sagger") wire-guided antitank missiles which had made their first appearance on Vietnam's battlefield just two days earlier.

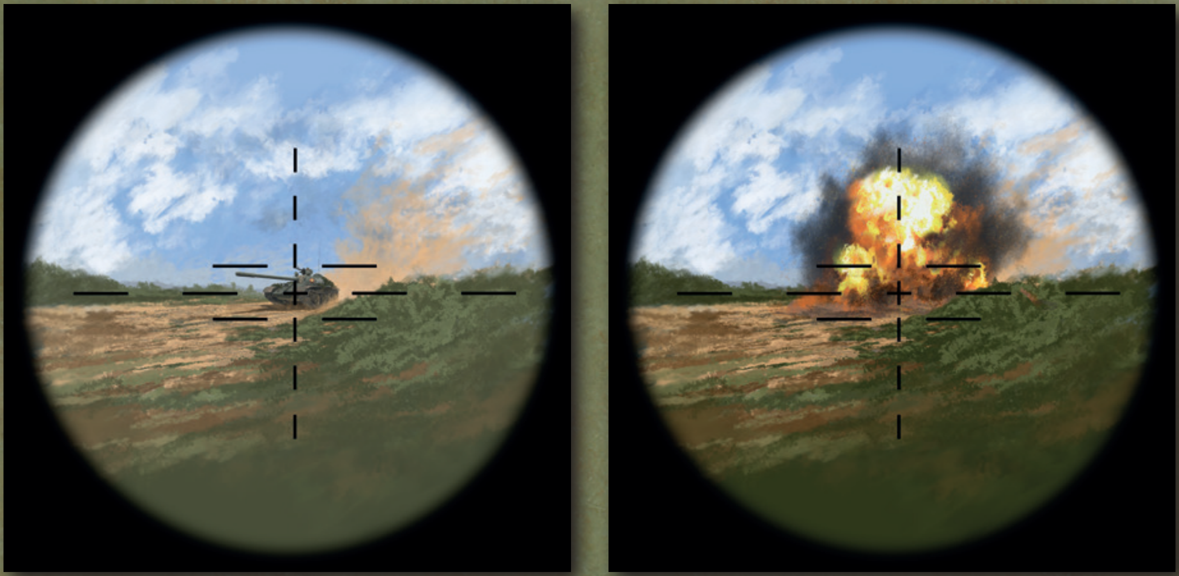
On April 27, PAVN forces launched a fresh drive upon Quang Tri. M41A3 crews fought valiantly to defend outlying bases and key features against the North Vietnamese armor, but they were typically overwhelmed through PAVN tactics and gunnery. For example, when M41s were deployed to assist in the capture of PAVN-held Hill 32, two were destroyed by dug-in T-54s. After 11 M41s were pushed off Hill 26 by an armored assault, the retreating ARVN column was then struck by an ambush from the 7th Armored Company, which destroyed three M41A3s and captured five others. (Captured tanks were quickly rebranded with communist insignia and put into action by the PAVN.) Even the 20th Tank Squadron was now being decimated.

On May 2, Quang Tri fell to the PAVN. By this point, the 1st Armor Brigade had lost 66 M41s, 43 M48s, and 103 M113s, a catastrophic toll that required the formation to be virtually rebuilt, as a US report from the time notes:

> In May the efforts of the Armor Command and its American advisors were primarily directed towards refitting and retraining of battered Vietnamese armor units. In June the retraining and refitting of Armor Command continued. The training of specialists in the areas of maintenance, communications, medicine, and administration was slow and unresponsive to the urgent replacement requirements. These unmet needs, coupled with

OPPOSITE
In August 1974, South Vietnamese troops inspect a T-54A destroyed near the village of An Dien, near Ben Cat, following a localized PAVN offensive. (Bettmann/Getty Images)

M41A3 GUNSIGHT VIEW

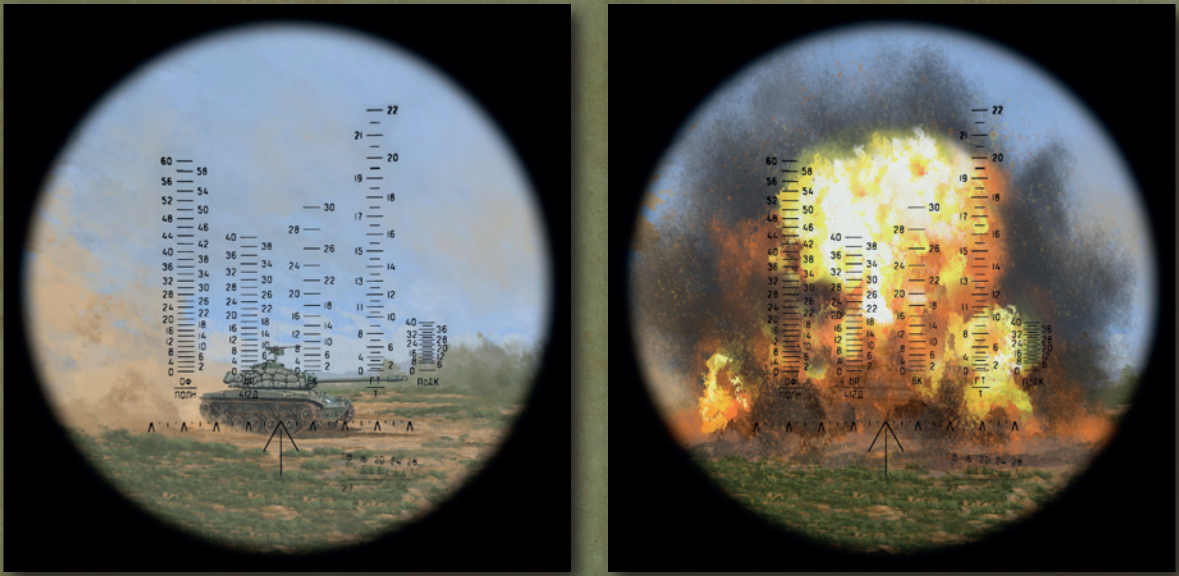


Here we have an ARVN gunner's view of a PAVN T-54 through the M41A3's standard M20 periscope gunsight. The M20 was a direct-fire sight, and the simple reticle pattern enabled quick target acquisition, both for the commander and the gunner – each had his own separate M20. The official US Army technical manual that came with the Walker Bulldog explained the reticle pattern thus: "The gun-laying reticle in the six-power system of the M20 periscope represents an angular measurement of 40 mils in width, with each horizontal line measuring five mils. The aiming cross in the center of the reticle, formed by intersection lines 2 mils long, is used as the boresight point and for laying the gun for the initial round at a stationary target" (Department of the Army 1956: 51). The fact that this tank is directly targeted on the center cross indicates that it is at extremely close range – probably less than 200m – and thus the gunner does not have to allow for drop. When fired, the HEAT shell – the best shell type for tackling the frontal armor – catches the T-54 on a vulnerable spot: a fuel tank just below the front slope plate, where the armor is 100mm thick, well within the capabilities of the HEAT shell. The result is a devastating explosion.

> the shortage of non-commissioned officers, created serious problems in restoring armor units to combat effectiveness.
>
> Tank gun ammunition remained in short supply in some units, but was not critical. Logistical support – including supply, maintenance, and transportation – continued to improve in June as the momentum of the enemy offensive slowed. (MACV 1973: C-50)

As the ARVN forces came to terms with the consequences of their retreat, the PAVN tankers were also feeling the pain of heavy combat losses. The first days of the Easter Offensive were largely conducted without the thunderous counter-response of US air power, but clearing weather meant that the helicopter gunships and strike aircraft began to get to work again in earnest. The gunships, and some tank-killing infantry units, also had at their disposal the new BGM-71 TOW (Tube-launched, Optically

T-54B GUNSIGHT VIEW



Here, an ARVN M41A3 tank is shown in the gun-laying reticle of a T-54B's TSh2B-32P telescopic sight at roughly 200m distance. The sight features a variety of scales for use of the different ammunition types, and this sight differed from the previous TSh2B-32 by including a scale for 3UBM8 APDS ammunition. The 3UBM8 APDS shell was introduced for the D-10T gun in 1967, with either steel or tungsten penetrators. Its penetration at 2km was 190mm at 0° and 80mm at 60°. In this instance the PAVN gunner has targeted the side of the M41A3, where the armor was only in the region of 19–25.7mm thick, so the shell easily carves through the side of the vehicle. The muzzle velocity of the 3UBM8 APDS shell was extremely high: 1,415m/s at the muzzle and 1,202m/s at 2km. Although the M41A3 could hold its own against the T-54 in terms of gunnery, when it came to armor protection the US-produced tank was extremely vulnerable, especially to a gun with such power and reach as the D-10T.

tracked, Wire-guided) antiarmor missile, which over the next weeks would destroy PAVN armor at astonishing rates, such was its accuracy and destructive power.

THE FIGHTING IN MR II

The fighting in MR II included some of the most intense clashes between M41A3s and T-54s. ARVN commanders had detected the PAVN buildup across the border for some time, sensing the threat to the cities of Kontum and Pleiku. Indeed, the PAVN had amassed some 50,000 troops for the attack into MR II, plus an armored force that included at least 50 T-54s. In the buildup to the attack, the South Vietnamese had M41A3s of the 14th and 19th ACSs at Ben Het, in poor static positions at the orders of the commander of the 22d Infantry Division, but the MR II commander, Lieutenant General Ngo Dzu, moved the 14th ACS and the 19th ACS up to key bases at Tan Canh and Dak To II.

One of the biggest threats to the ARVN M41s was the RPG-2 shoulder-launched antitank weapon shown here, and its world-changing successor, the RPG-7. The PG-2 grenade fitted to this RPG-2 was capable of penetrating up to 180mm of armor, far deeper than any armor surface on the M41. (AFP/Getty Images)

Probing attacks in the region began in March 1972, and escalated into a mass PAVN offensive in April in concert with the attacks on the other military regions. Both Tan Canh and Dak To II came under intensive PAVN assaults, including heavy use of T-54s. The limited numbers of M41s deployed around these positions were completely unable to stem the tide. In one action at Cam Tanh, T-54s assaulted the command post of the 42d Infantry Regiment, frantically defended by a mixed infantry and armor force. Four M41s were destroyed by T-54 gunnery and the command post quickly fell. At Dak To II, ammunition depletion became a real, and very mortal, problem for the M41 crews, as they took on 15 T-54s from the 3d Company, 297th Armored Battalion. During one engagement, two M41s moved quickly on the offensive, and achieved multiple hits on the lead T-54 in the enemy formation. Yet by this point they were firing only high-explosive shells, having run out of armor-piercing types, the high-explosive munitions failing to penetrate the T-54s' armor plate. In response, the T-54 rapidly engaged the two threats, destroying the first with just two rounds and the second with a single shot. Shortly after, another T-54 wiped out four M41s, and yet another destroyed a further two Walker Bulldogs. It was clear that here the M41s were being emphatically outgunned, although had appropriate levels of antitank shells been available to ARVN forces, the balance sheet of losses could have been more even. In return, M72 LAW (Light Anti-Tank Weapon) rockets, helicopter gunship TOW missions, and fixed-wing air strikes imposed numerous kills on the PAVN tankers.

Although the PAVN forces were eventually victorious at Tan Canh and Dak To II, the momentum of their offensive faltered, giving the chance for ARVN armor to regroup and recover. On May 14, the North Vietnamese resumed the attack with the first of two pushes on Kontum, but this time they were stopped, despite T-54s and infantry pushing into the northern suburbs. M41s of the 3d ACS pushed up Route 14

New supplies of M41A3s had to be brought into South Vietnam to make up for losses in the Easter Offensive fighting. Here a Walker Bulldog is unloaded from a C-5A Galaxy transport aircraft at Tan Son Nhut Air Base on May 23, 1972. This specific aircraft carried three tanks, and all three were deployed to defensive positions around Saigon. (Bettmann/Getty Images)

to reach and reinforce Kontum, while 18 M41s of the 8th ACS supported infantry in clearing the streets of the city.

THE FIGHTING IN MR III

The PAVN offensive into MR III began on April 2 with massive force, including 63 T-54s of the 20th and 21st Armored battalions, composing the 24th Armored Group. In terms of the armored assets in the region, the South Vietnamese deployed the 3d Armor Brigade, which had 120 M41s and 345 M113s. Much of the ARVN armor deployed in haste to positions around Loc Ninh, and there awaited the appearance of PAVN tanks. They did not have to wait long. On April 5 a large force of T-54s, supported by ZSU-57-2 self-propelled antiaircraft guns, their autocannons leveled for ground fire, engaged the M41s at close range on the Loc Tan intersection. The exact details of the battle are not available, but the outcome certainly was – 52 ARVN vehicles were destroyed, including 12 M41s. (Data for PAVN losses in this engagement are not available.)

By this stage in the action the ARVN forces were collapsing in MR III, and the South Vietnamese had lost the equivalent of a battalion of armor in just four days. The city of An Loc came under a PAVN siege that lasted for 66 days. Yet in the pattern that now repeated itself across South Vietnam, the PAVN offensive ground to a bloody halt. Overwhelming US and South Vietnamese air power, plus massive artillery bombardments, had imposed unsustainable casualties on the communist forces. Losses of PAVN armor were extremely heavy, with entire companies of T-54s ripped apart by B-52 Stratofortress air strikes and numerous individual vehicles destroyed or disabled by tank-hunting infantry in South Vietnamese towns and cities. The Easter Offensive rumbled on with fighting throughout the summer, but by early autumn it was a spent force. Partial PAVN retreats took place, although the North Vietnamese managed to hang on to territory that would, in the future, serve them well as jumping-off platforms for the final offensive in 1975.

STATISTICS AND ANALYSIS

In yet another attempt to seize victory through conventional warfare, the PAVN's Easter Offensive had run up against the muscle of the United States and an ARVN replete with the firepower of Vietnamization. For North Vietnamese armor, the consequences were particularly grievous: losses during the Easter Offensive have been estimated at 134 T-54s, 56 PT-76s, and 60 T-34s, suggesting that approximately two-thirds of the PAVN's tanks had been destroyed. That being said, calling the Easter Offensive a South Vietnamese victory is rather stretching the point. Accurate casualty figures are difficult to come by, but the ARVN forces also lost anything up to 1,000 armored vehicles, and entire M41A3 units had either been wiped out or left with few vehicles for future operations. Both sides would partially recover, but in 1973 all US combat elements left Vietnam. ARVN forces would now be fighting on their own.

Analyzing the battles between the M41A3s and T-54s in South Vietnam is not a simple matter of comparing the battlefield results of "clean" engagements between opposing vehicles. As the accounts above demonstrate, the outcome of battle was a near-indeterminable mix of tactical decisions (or indecision), unit morale and psychology, crew training, and many other factors, all wreathed in the thick fog of war. This is why, for example, Operation *Lam Son 719* involved clashes in which M41s wiped out entire companies of T-54s while suffering no losses themselves, while the Easter Offensive saw dozens of M41s routed by North Vietnamese combined infantry–armor attacks.

Informing this debate is an impassioned January 1973 article in *ARMY* magazine, penned by Colonel Raymond R. Battreall, Chief of Staff of the Army Advisory Group, MACV, who was also the senior advisor to the ARVN Armor Command between July

1970 and early April 1972. The article was written in response to an August 1972 piece by one Bernard F. Halloran, entitled "Soviet Armor Comes to Vietnam," which among other things contended that ARVN forces had largely ignored the PAVN armor threat prior to the Easter Offensive and that the T-54 was superior to the M41 and equal to the M48.

This dramatic image of three T-54s, wiped out in Saigon in 1975, shows that the dangers to T-54 crews remained right until the end of the Vietnam War. The deep gouge through the turret of the burning tank suggests a tank-shell strike. Note also how the intense heat of the fires has warped the barrel of the tank on the right. (© Jacques Pavlovsky/Sygma/CORBIS/Sygma via Getty Images)

On the first point of order, Battreall argues that "I can state categorically that as early as February, 1971, RVNAF armor units had been thoroughly indoctrinated on the strengths and weaknesses of the PT76, T34/85 and T54/100 and had been supplied with the appropriate ammunition and engagement instructions to defeat them" (Battreall 1973: 3). To prove his point Battreall cited the one-sided engagement around Hill 31 during Operation *Lam Son 719*, noting that while four of the five M41s did not survive the offensive, all succumbed to RPG attacks rather than tank shells. Battreall also points to the victorious clashes of M48A3s (a tank he declares as "vastly superior" to the T-54) against T-54s to reinforce his contention, and makes a statistical claim that between March 31 and November 4, 1972, absolutely no ARVN tanks were lost to enemy tank gunfire, against 139 PAVN tanks to ARVN gunnery.

Subsequent careful research, some of it presented in the combat accounts above, shows such statistical data to be notably wide of the mark. Even so, Battreall's comments do lead us to some interesting considerations. Comparing Operation *Lam Son 719* and the Easter Offensive, it becomes evident that M41 and T-54 engagements tended to be a matter of either/or outcomes – either one side was excessively dominant and the other beaten off with heavy losses, or vice versa. This suggests that tactics rather than technology was the deciding factor in these clashes. ARVN tank training was, as we have seen, of a generally high standard, and on occasions in which M41 tank troops could select their terrain, positioning, and maneuver options, they appear to have come out on top. Conversely, when the tactical framework in which they operated was imposed upon them – often by infantry officers unaccustomed to the principles of armored warfare – the results were generally disastrous for the M41s and their crews.

By aggregating a collection of US combat evaluations between 1968 and 1972, some clear points emerge about the improper use of armor by the ARVN, as perceived by advisors attached to the ARVN units. The points can be summarized as follows. First, there was often a fundamental disconnect in understanding between armor and infantry, leading to senior infantry officers ordering tanks to make deployments or commit to actions with tactical constraints that actually threatened armor survivability. The infantry did not understand that mobility was armor's greatest strength.

Second, in a related point, armor was often used in static defensive roles, employed around fixed positions such as bases, supply depots, road intersections, bridges, and military installations. By positioning the ARVN armor thus, the PAVN forces could orientate themselves to the shape and strength of the defenses, planning routes of attack, gathering range information, and identifying targets prior to the actual assault, thereby increasing their combat effectiveness.

Third, while on the offensive the ARVN forces as a whole proved to be capable, command-and-control could quickly break down amid enemy counterattacks or retreat conditions. This was evident during both Operation *Lam Son 719* and the Easter Offensive. This point should not be stretched too far, however, as panic and disorder can set in to even the most professional forces in the face of impending defeat. It seems clear, though, that ARVN infantry–armor cooperation could quickly degenerate, leaving armor isolated and reactive rather than part of an integrated defense.

Fourth, tanks would often be employed in piecemeal small units, rather than in the larger infantry–armor formations that could have had maximum benefit on the battlefield.

Compounding all the issues outlined above was the undeniable fact that the drawdown of US combat troops and support in Vietnam was having a detrimental impact on the combat capability of South Vietnam as a nation. US armor was finally stood down from operations in April 1972, just as the Easter Offensive struck, resulting in an overall force reduction that could only partially be compensated for by the materiel volume of Vietnamization.

An interesting reflection on the roles of M41s in particular is found in a 1969 US military report, which explained the tactical remit of an M41A3 tank troop:

> The tank troop fills one of two broad roles, depending on the degree of trafficability of the area. In some areas it shifts from one role to the other with the seasons. Where mobility is comparatively unrestricted it functions as a primary mobile assault force (i.e., as a main-battle-tank unit) in close cooperation with the Infantry and with armored personnel carriers. Where movement, while possible, is limited, it yields the primary assault role to the carriers and supports their action by heavy direct fire from as close a range as possible. (Andreacchio 1969: 19)

The record suggests that M41s operating in the first of these roles could be successful. In the second role, if the PAVN forces had heavy armor of their own, then the risks to the ARVN tankers were far greater. In fact, in many of the battles between the two tanks, it seems that if the M41s could engage the T-54s at medium or long ranges, the ARVN tankers' superior gunnery skills could pay off. Once the PAVN tanks had moved to close ranges, or launched an ambush, then the weight of casualties seemed to fall disproportionately on the ARVN tanks.

Turning to the PAVN, the North Vietnamese tactical handling of armor was also problematic. In the late 1960s and early 1970s, the standards of PAVN training and gunnery could be found wanting. Even though the roots of PAVN armor went back to the 1950s, the adoption of heavy armor such as the T-54 was still a relatively new phenomenon for the North Vietnamese forces. There was a tendency for the armor to be committed to battle without close coordination with infantry; armor was often used as a blunt instrument to try to smash open positions, while infantry followed in its wake. A MACV report written in the aftermath of the Easter Offensive also noted how, as in the ARVN forces, PAVN tanks could be parceled out in small numbers, critically diluting their offensive impact:

This photograph, taken in 1985, shows two soldiers examining the gun barrel of a wrecked M41A3 in a rural armor depot, where wrecks of equipment captured in wartime are used for spare parts. Note the M48A3 behind it, likely a remnant of the 20th Tank Squadron. (Dirck Halstead/The LIFE Images Collection/Getty Images)

> At one point in the current [Easter] offensive in MR I, [PAVN] infantry regiments were occasionally supported by two tank companies each. Logistical difficulties and heavy combat losses have frequently dictated much less intensive support. Whatever the level of support, NVA ground commanders frequently employ tanks in such small numbers and so devoid of infantry and artillery support as to negate much of their inherent fire power and shock potential. (MACV 1972: 2)

The least effective applications of the PAVN's heavy tanks occurred when they were committed into the narrow streets of urban zones, where the tanks' mobility and all-round awareness almost disappeared. A large number of T-54 losses were the result of light antiarmor weapons, fired at close quarters in ambush. Without infantry support, the T-54s were often sitting ducks.

Beyond the tactical considerations, however, it does appear that the M41 and the T-54 were, despite their differences in armor categorization, close to each other in combat capability. Battreall makes the valid point that although the T-54 had far heavier armor, even the most substantial plate was not capable of stopping penetration by the 76mm armor-piercing rounds. Indeed, he notes that the T-54's front hull armor, some of its thickest, could easily be defeated by modern HEAT shells. The large fuel storage hold just behind the front slope plate was readily ignited by the HEAT plasma jet; HEAT shells do most of their destructive work by igniting fuel and ammunition, rather than through spalling, so by having a fuel source in the forward hull the armored protection of the T-54 was seriously compromised. Battreall also argues that the interior space of the T-54 was cramped and inefficient when it came to rapid gunnery, not least because of the fact that the breech of the gun was so close to the back wall of the turret that the gun needed to be raised to full elevation for reloading between each shot.

Both the M41 and the T-54 were, within their own limitations and potentials, effective combat vehicles. The details of each individual battle between these types during the Vietnam War are often partial or unavailable, the historian frequently having to extrapolate from outcomes. What is clear, however, is that it is not possible to assert the clear superiority of one type over the other, at least when wider human and tactical considerations are taken into account.

AFTERMATH

On April 30, 1975, Saigon fell to the North Vietnamese, following a 55-day offensive that finally claimed South Vietnam for communism after 20 years of war and millions of dead. In a fitting conclusion to this study, PAVN T-54 tanks crashed into the grounds of the Presidential Palace, and surged in menacing columns down the Saigon streets, flags waving in victory. The final campaign in the Vietnam War had been horribly costly for both sides. Casualty figures are only ever approximate, but while the PAVN suffered some 20,000 casualties, the number of ARVN dead, wounded, and missing may have been as high as 90,000, plus by May 5 some 1.1 million serving soldiers had surrendered. Civilian casualties are likely to have been far higher than the military tolls.

T-54 tanks line up following the PAVN victory in 1975. The sheer length of the D-10T gun is evident here, terminating in its long fume extractor. (PHAN KHAC DUONG, PHAN THANK GIAN/AFP/Getty Images)

The remaining M41 units in Vietnam fought where and when they could during those months, but by 1975 their combat capability had been much depleted. US aid to South Vietnam had begun to drop precipitously from 1973. In the fiscal year 1973, total US military aid to South Vietnam was US$2.8 billion, but by 1975 it was just US$300 million. These cuts were felt on the front lines. At the beginning of the Spring Offensive in 1974, the South Vietnamese had roughly 350

This T-54 tank (front) belongs to the Afghan National Army, and is shown here on active service in 2006. The tank would have been supplied to the Afghan Army at some point during the Cold War, or left behind amid the Soviet retreat from Afghanistan in 1989. (Sgt Frank G Proctor/MOD)

tanks of all types and some 880 APCs, while the PAVN had *c.*655 tanks and APCs. ARVN armor was still a respectable force, but there was a severe squeeze on spare parts and maintenance facilities and, most crucially, ammunition. By the end of 1974, the total supply of tank and artillery shells in South Vietnam had dropped to just 100,000 rounds, meaning that ARVN tank crews went into action with ammunition racks only partially full. Furthermore, they could no longer rely upon heavy artillery support, traditionally a force that had swung battles their way; some ARVN artillery batteries were down to just four rounds a day. The outcome was all but inevitable.

The M41 and T-54 would both continue to see service – and combat – after 1975, but their subsequent operational careers were quite different. The T-54 would become one of the most commercially successful and widely distributed tanks of the Cold War, especially when taken together with its T-55 variant. The T-55, accepted for service in the Soviet Army in 1958, was essentially a T-54 but with an NBC package fitted and improvements to many elements, including ammunition storage capacity, weight of armor, powerplant, and optics. Including license-built models from Poland and Czechoslovakia, an estimated 85,000–100,000 T-54/55s were built up to 1983. In addition, 9,500 Type 59s were produced under license by China.

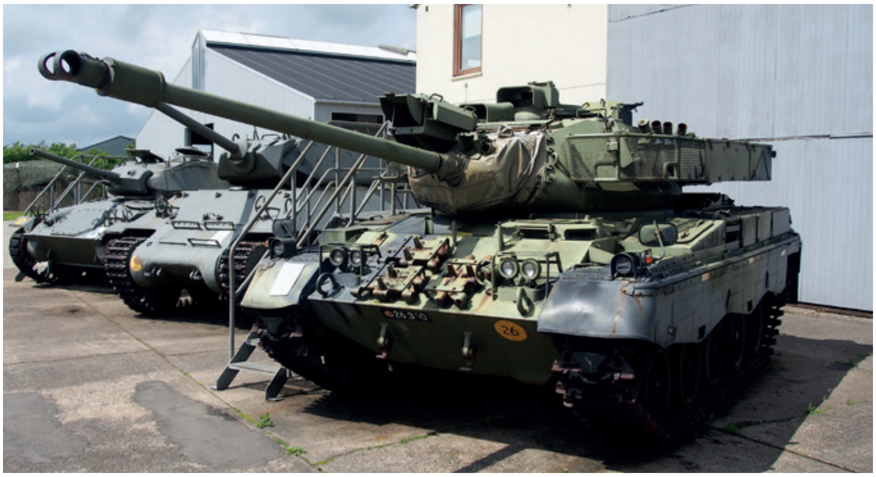
T-54s continued to serve in the Vietnamese armed forces after 1975, although the T-54's successor, the T-62, was purchased from North Korea in the late 1970s. Vietnamese T-54s and Type 59s would face large numbers of similar Chinese tanks during the Sino-Vietnamese War of February–March 1979, the Chinese deploying 300 Type 59, Type 62, and Type 63 tanks in the short conflict.

The story of the T-54 outside Southeast Asia is a complex and eventful one, and only the briefest of outlines is possible here. The T-54/55 was ultimately exported to more than 50 countries, from Albania to Zimbabwe, and consequently featured prominently in many major conflicts. Wars in which the T-54 fought in significant numbers include: the Arab-Israeli wars of the 1950s–70s; the Angolan Civil War (1975–2002) and numerous other African civil conflicts; several Indo-Pakistan confrontations (1960s–80s); the Iran–Iraq War (1980–88); the Yugoslavian wars (1991–2001); and in the recent struggles of the Arab Spring, including in Syria. The T-54, alongside successors such as the T-62 and T-72, also directly faced Western armor during both Operation *Desert Storm* (1991) in Kuwait and Iraq and during the

2003 invasion of Iraq. During both of these conflicts, the T-54/55s (and indeed the later tanks) were almost invariably outclassed by the US M1 Abrams and British Challengers and their crews, and were also destroyed en masse by air power. Indeed, wherever the T-54 has faced well-trained crews in modern Western armor, it has tended to come off a mortal second, primarily because the main export markets for the T-54 have tended to be countries with more command-centered and poorly trained or equipped armies, at least comparably so. This being said, the T-54/55 continues to serve in armies around the world today, through extensive upgrade packages to armor, communications, fire control, turret, and hull, to the extent that they have become virtually new types of tank. Such modifications will keep the T-54 on the battlefield for many years to come.

For the M41 Walker Bulldog, the post-Vietnam phase of life has been less prominent, not least because production ended in 1954 with fewer than 5,500 individual tanks having being built. Furthermore, by the time the United States began transferring M41s to Vietnam, the era of the light tank was ending, as superior MBTs and IFVs entered service. Unlike the T-54, the M41 did not see major combat service after Vietnam; the only other operational use seems to have been in the hands of South African forces during incursions into Angola in the mid-1970s. Nevertheless, 23 foreign customers took M41s into service during the Cold War years, including Austria, Denmark, Ethiopia, Pakistan, Saudi Arabia, and Sudan. West Germany bought 50 M41s as the first postwar tank for the Bundeswehr, and later modernized the vehicles and sold them on to the Royal Thai Army. Interestingly, in 1975 the Republic of China (Taiwan) also produced an up-armored, more powerful copy of the M41 called the Type 64, although only 30 vehicles were manufactured. Continual modifications and service upgrades have kept some examples of M41s on active service to the present day.

Reminders of the battles between the M41A3 and T-54 are still very much present in modern Vietnam. Some specimens are preserved in pristine condition in state museums, while other examples lie rusting and entwined with foliage in remote parts of the Vietnamese jungle. Whatever their condition, they are mute but poignant reminders of an often-overlooked chapter in the history of armored warfare.



The M41 DK-1 was an M41 modernized for the Royal Danish Army, fitted with an NBC protection system, an external laser rangefinder, and thermal-imaging equipment. (Alf van Beem/Wikimedia/Public Domain)

BIBLIOGRAPHY

Andreacchio, Nicholas (1969). *An Historical Analysis of ARVN Armor Operations from Conception to the Present, Focusing on the Two Northern Provinces*. Produced for MACV.

Anonymous (*c.*1973). "ARVN 20th Tank at Dong Ha." No further details available.

Army Concept Team in Vietnam (1966). *Final Report: Armor Organization for Counterinsurgency Operations in Vietnam*. San Francisco, CA: Army Concept Team in Vietnam.

Battreall, Raymond (1966). "Armor in Vietnam," in *ARMOR* magazine, May–June 1966: 4–8.

Battreall, Raymond (1973). "RVN Armored Forces and Soviet Tanks," in *ARMY* magazine, January 1973: 3–4.

Department of the Army (1956). *Tanks, 76-mm Gun M41 and M41A1 Walker Bulldog: FM 17-80*. Washington, DC: Department of the Army.

Grandolini, Albert (2015a). *The Easter Offensive 1972: Volume 1: Invasion Across the DMZ*. Solihull: Helion.

Grandolini, Albert (2015b). *The Easter Offensive 1972: Volume 2: Tanks in the Streets*. Solihull: Helion.

Ha Mai Viet (2008). *Steel and Blood: South Vietnamese Armor and the War for Southeast Asia*. Washington, DC: Naval Institute Press.

Hughes, Chris "Toadman" (2010). *M41 Walker Bulldog: Walk Around*. Carrollton, TX: Squadron/Signal Publications.

Icks, Robert J. (1972). *M103 Heavy Tank + M41 Walker Bulldog*. Profile AFV Weapons 41. Windsor: Profile Publications.

Kinnear, James & Stephen I. Sewell (2018). *Soviet T-54 Main Battle Tank*. Oxford: Osprey.

MACV (November 8, 1972). "Review of PAVN Armor Tactics and Training." South Vietnam: MACV.

MACV (Military History Branch) (1971). *1971 Command History*. Alexandria, VA: Department of the Army.

MACV (Military History Branch) (1973). *1972–73 Command History*. Vol. 1. Alexandria, VA: Department of the Army.

Ngo Quang Truong (1980). *The Easter Offensive of 1972*. Washington, DC: US Army Center of Military History.

Nguyen Duy Hinh (1979). *Lam Son 719*. Washington, DC: US Army Center of Military History.

Oldinsky, Frederick (1976). "Armor in Vietnam" (thesis). San Antonio, TX: Trinity University.

Project Checo (March 24, 1971). *Lam Son 719 30 January–24 March 1971: The South Vietnamese Incursion Into Laos*. HQ PACAF: Directorate of Operations Analysis.

Starry, Donn (1978). *Mounted Combat in Vietnam*. Washington, DC: Department of the Army.

US Army (1963). *Armor Operations, FM 17-1*. Washington, DC: Department of the Army.

INDEX

References to illustrations are shown in **bold**.

- ammunition: (M41) 27, 29, **29**, 30, 47, **47**, 68, 70, 75, 77; (T-54) 31, **31**, 32, 69
- antiarmor weapons 6, 34, 37, 64, 66, 68–69, 70, **70**, 73
- ARVN armor forces 5, **5**, 6, **6**, 8, 9, 17, 23, **25**, 29, 34, **34**, **35**, 36, **37**, 40, 42–43, 48, 49, **49**, **54**, 55–56, **56**, 58–59, **58**, 62–63, 63–64, 65, **65**, 66, 70–71, **71**, 72, 73–74, 76
  - Armor Branch 42–43, 64
  - Armor Command 8, 42, 49, 66, 68, 72–73
  - Armor Division 38
  - Armor School 42, 48
  - armd bdes 9, 42: 1st 9, 43, 55, 56, 58, 62, 63, 65, 66; 2d 43; 3d 43, 55, 71; 4th 43
  - armd cav sqns 43, 65: 1st/2d 43; 3d 43, 70–71; 4th–7th 43; 8th 43, 71; 9th/10th 43; 11th 43, 55, 56, 58, 62, 66; 12th–16th 43; 14th 69; 17th 43, 55, 56, 58, **60–61**, 62; 18th 43, 66; 19th 43, 69
  - combat kills 9, 59, **60–61**, 62, 66, 73
  - combat losses 9, 25, **29**, **37**, **54**, 59, 62, **62**, 63, 64, 66, **66**, **69**, 70, 71, 72, 73, 74, **75**, 76
  - crews, caliber of 6, 46, 48, 49, 50, 63, 74: training of 42, 46, 48, 49–50, **49**, 52, 53, 62–63, 73
  - doctrine/tactics 46, 48, 73–74: armor–infantry cooperation 52, 53, 73–74
  - mechanized units (M113) 24, 37, 42
  - strength 38, 55, 56, 71, 76–77
  - tank sqns: 20th 43, 64, 65, 66, **75**; 21st/22nd 43
  - tank troops 42, 43, 58, 66, 74
  - US advisory detachments 46, 48, 66
  - US materiel support 6, 37–38, 42, 49, 55, 72, 74, 77

- Cadillac Motor Car Division 12–13, 16
  - Cleveland Tank Plant 8, 13
- Cambodia, forces to/from **19**, 38, 40, **41**

- Easter Offensive (1972) 4, 9, 39, 44, 53, 62, 64, 65, 66, 68, 72
  - ARVN armor 65, 71: losses 9, 66, **66**, 70, 71, 72
  - PAVN armor 64–65, 69, 71: kills 66, 70; losses 68–69, 71, 72, 73

- gun-stabilization systems 12, 22, 23, 32, 51
- guns (main) 49: 76mm 12, 14, 15, 17, **47**; 85mm 17, 18; 90mm 65; 100mm 18, 19, 20, **21**, 22, **32**, **51**, 69, **76**

- Ho Chi Minh Trail 38, 40, **41**
- Hoang Xuan Lam, Maj Gen **38**

- Laos, forces/fighting in 24, **41**, 53, **54**, 56, 64; *see also* Operation *Lam Son 719*

- M3/M5 Stuart light tank 11, 43
- M24 Chaffee light tank 11, 42, **43**
- M41/M41A1 "Little Bulldog" light tank **11**, 13, 16–17
  - design and development 5, 6, 8, 10, 11–16: T37 Phase I–III vehicles 8, 12; T41/T41E1 vehicles 8, 12–13, **12**; T41E2 vehicles 8, 13, 14–16
  - design features: armament 5, 6, 14–15; crew compartment 14–15
  - firepower 6
  - production 13
  - US Army service 8, **13**, 15–16, **16**
- M41A3 Walker Bulldog light tank **8**
  - ARVN service 5, **5**, **6**, 8, 9, 17, **25**, 29, 34, **34**, **35**, 36, **37**, 42, 43, **49**, **54**, 55, 56, **56**, **58**, 59, 65, 66, 70–71, **71**, 73–74, 76: kills 9, 59, **60–61**, 62, 66; losses 9, 25, **29**, **37**, **54**, 62, **62**, 64, 66, **66**, **69**, 70, 71, 72, 73, **75**
  - features/systems **6**, 8, **13**, 15–16, **15**, **25**, **27**, 28, **29**, 30, 32, **34**, **35**, **44**, 47, **47**, **56**, **58**, **68**: armament **5**, **6**, 11, 14, 28, 30, 44, **47**, 48–49; armor 11, 14, 26, 27, **27**, 69; design vulnerabilities 27, 69; modifications/upgrades 34, 78; specifications 11, 14, **15**, 24, 25; turret layout/crew positions **6**, 14, 15–16, 27, 28, **44**, 47, **47**, 48–49, 73
  - firepower/performance 11, 14, 24–25, 26, 27, 28, 29, 30, 33, 60–61, 62, 63, 74, 75: ammunition for 29, **29**, 30, 33, 47, **47**, 49; vs. T-54 5, 9, 27, 29, 36, 40, 59, 64, 69, 72, 73, 74, 75; vs. Type 59 5, 64
  - production 16, 78
- M41 DK-1 light tank **78**
- M47 Patton medium tank 10, **11**
- M48 Patton medium tank 10, **11**, **28**, 65, 73
  - armament 65, 70
  - armor 65
  - ARVN use 9, 43, 64, 65, **65**, 66: kills 9, 66; losses 66, **75**
- M60 Patton medium tank 10–11
- M103 (T43) heavy tank **11**
- M106 APC 42
- M107 SPG **54**, **58**
- M113 APC 11, 24, 42, **58**, 65, **65**, 71
  - losses 59, 62, 63, 66
- M551 Sheridan light tank 5, 10
- machine guns: (M41) **5**, **6**, 12, **12**, 14, **15**, 34, 44, **47**, 48, 49; (T-54) 7, **7**, **9**, 20, **21**, 32, 34, **50**, 51, 63, **63**
- Malyshev, Vyacheslav A. 18–19
- Morozov, Aleksandr M. 18, 22

- Operation *Lam Son 719* 9, 36, 38, 40, 45, 55–56, **57**, 58–59, **58**, 62–64, 73
  - ARVN armor 36, 40, 55–56, **56**, **57**, 58–59, **58**, 62–63, 63–64, 72, 74: kills 9, **60–61**, 62, 66; losses 9, 62, **62**, 63, 64, 73
  - PAVN armor 36, 38, 40, 44, 53, 55, **57**, 59, 62, 63, 71, 72: losses **60–61**, 62, 63–64

- PAVN armor force **1**, 4–5, **4**, 6, **7**, 17, **21**, **22**, 23, **26**, 33, 34, 36, 38, 40, 44–45, 52–53, 55, 56, 58, 59, 62, 63, 64, 65, **67**, 69, 70, 71, 72, 73–75, 76, **76**, 77
  - antiarmor teams 9, 52, 62, 64
  - Armor Command 53
  - Armor School 64
  - armd bns 44: 3d 64; 4th 64, 65; 6th 64; 20th/21st 64, 71; 171A/171B/177th/195th/198th 64; 297th 64, 70; 397th 64, 65; 512th 64
  - armd cos 44, 66, 70
  - armd groups 71
  - armd regts 9, 45, 56: 201st 45, 64; 202d 9, 44, 45, 50; 203d 4, 45, 64; 207th 45
  - combat kills 62, 66, 70
  - combat losses 9, 36, 38, **40**, 50, 59, **59**, **60–61**, 62, 63–64, 66, 68–69, **68**, 70, 71, 72, 73, **73**, 75, 76
  - doctrine/tactics 45, 52, 53, 66, 74–75: combined-arms cooperation 9, 52, 53, 58, 64–65, 74–75
  - independent armd bns/cos 45, 64
  - mech. (APC) regts: 66th/202d/244th 64
  - tank bns 45, 62
  - tank cos 45, 75
  - tank crews, recruitment/training 6, 46, 50, 52, 53, 56, 63, 64, 66, 70,74, 76
  - US assessment of 52, 53
- PT-76 amphibious light tank 17, 73
  - PAVN service 44, 56, 59, 64: losses 9, **40**, 59, **59**, 63, 66, 72

- Quang Tri, fighting for 9, 65, 66, **66**

- radio sets: (M41) **6**, 34, 47; (T-54) 23, 34, **51**
- rangefinders: (M41) 12, 32–33, **78**; (T-54) 30, 32–33
- Robertson, Lt Gen Donn J. **38**

- Saigon, fighting for **1**, 4, **7**, 9, **22**, **26**, **35**, **37**, 71, **73**, 76, **76**
- sighting devices (M41) 28, 30, 32, 47, **47**, **68**; (T-54) 22, 23, 30, 32, 51, **51**, 53, **53**, 69, **69**
- Soviet tank plants 18, 19, 21, 22
- Spring Offensive (1974) 39, 76–77
- Starry, Gen Donn A. 46, 59

- T-34 medium tank 17–18, 19
  - PAVN service 63, 64, 72
- T-34/85 medium tank 11, 18, 73
  - PAVN service 44, 45
- T-43/-44 medium tanks 18, 19
- T-54 (Obiekt 136/137) main battle tank 11
  - ammunition for 33, **33**, 75
  - ancestry/development 8, 10, 19, 17–21: Obiekt 136/137 programs 8, **17**, 18, 19
  - features/systems 18, **18**, 19, 22, 26, **26**, **28**, 30, 32, 33, **33**, 34, 51, **53**, 75: armament 5, 19, 29, 30, 32, 63, 69, 75, **76**; armor 5, 6, 19, 24, 26, 29, 63, 70, 75; design vulnerabilities 17, 62, **68**, 75; specifications 24, 25; turret layout/crew positions **17**, 19, **32**, 33, **33**, **45**, **50**, **53**, 75, 78
  - firepower/performance 6, 25, 26, 27, 28, 29, 30, 33, 74, 75, 77–78: vs M41A3 5, 9, 29, 36, 40, 59, 64, 69, 72, 73, 74, 75
  - PAVN service 5, 23, **26**, 33, 34, 44, 45, 56, 58, 59, 64, 70, 71, 75, 76, **76**: kills 70; losses 59, **60–61**, 62, 63, 66, **68**, 71, 72, **73**, 75
  - production 22, 77
- T-54 Model 1946 (T-54-1) 8, 19, 20–21
- T-54 Model 1947 20
- T-54 Model 1949 (T-54-2) 20–21
- T-54 Type 49 30; T-54 Type 51 32
- T-54 Type 1951 (T-54-3) 21
- T-54A (Obiekt 137G) main battle tank 22
  - ammunition for 31, **31**, 32
  - copying of (Type 59) 5, 9, **9**, 23
  - features/systems 22–23, 30, 32
  - performance 23; production 23
  - use/users 22: PAVN **1**, 23, **67**; Soviet Army 8
- T-54B main battle tank
  - ammunition for 31, **31**, 32, 51, **51**
  - features/systems **21**, **22**, 23, 30, 32, **51**, **69**: armament 32, 51, **51**; armor 20; specifications 20, **21**; turret layout 20, 51, **51**
  - firepower/performance 20, 23
  - production 9, 23
  - use/users: PAVN **4**, **7**, **21**, **22**, 23
- T-55 main battle tank 23, 45, **45**, 77–78
- T-55A main battle tank **17**
- T-62 (Obiekt 430) 10, 22, 77
- Tet Offensive (1968) 4, 36, **37**, 38, 52, 55, 64
- Type 59 main battle tank 9, **9**, **19**, 34, 77
  - PAVN service 5, 23, 34, 44, 45, 64, 66

- US Army armor/infantry forces 6, 9, 11–12, 13, **13**, 15–16, 36, 37–38, 46, 48, 50, 64, 72, 74: MACV 40, 46, 72, 74–75

- Walker, Gen Walton H. 13–14

OSPREY PUBLISHING
Bloomsbury Publishing Plc
PO Box 883, Oxford, OX1 9PL, UK
1385 Broadway, 5th Floor, New York, NY 10018, USA
E-mail: info@ospreypublishing.com
www.ospreypublishing.com

OSPREY is a trademark of Osprey Publishing Ltd

First published in Great Britain in 2019

© Osprey Publishing Ltd, 2019

All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, or any information storage or retrieval system, without prior permission in writing from the publishers.

A catalog record for this book is available from the British Library.

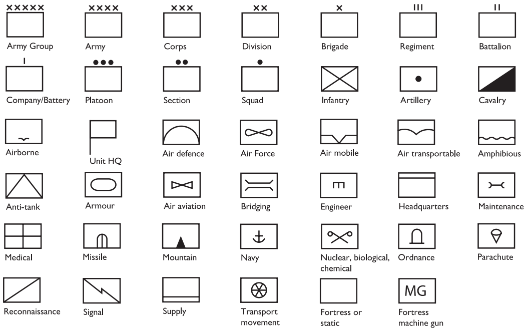
ISBN: PB 9781472836120; eBook 9781472836113;
ePDF 9781472836106; XML 9781472836137

Maps by bounford.com
Index by Rob Munro
Typeset by PDQ Digital Media Solutions, Bungay, UK

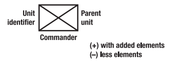
Osprey Publishing supports the Woodland Trust, the UK's leading woodland conservation charity.

To find out more about our authors and books visit **www.ospreypublishing.com**. Here you will find extracts, author interviews, details of forthcoming events and the option to sign up for our newsletter.

Key to military symbols


Army Group
Army
Corps
Division
Brigade
Regiment
Battalion
Company/Battery
Platoon
Section
Squad
Infantry
Artillery
Cavalry
Airborne
Unit HQ
Air defence
Air Force
Air mobile
Air transportable
Amphibious
Anti-tank
Armour
Air aviation
Bridging
Engineer
Headquarters
Maintenance
Medical
Missile
Mountain
Navy
Nuclear, biological, chemical
Ordnance
Parachute
Reconnaissance
Signal
Supply
Transport movement
Fortress or static
MG
Fortress machine gun

Key to unit identification


Unit identifier
Parent unit
Commander
(+) with added elements
(–) less elements

Acknowledgments
The author would like to thank the illustrators of this book, Alan Gilliland and Johnny Shumate, for their fine work bringing technical details and battlescenes to life. My appreciation also goes to Nick Reynolds, Commissioning Editor at Osprey, for his continual support with this and many other projects.

Editor's note
For the most part, metric measurements are used in this book, with the exception of calibers. For ease of comparison please refer to the following conversion table:

1m = 1.09yd / 3.28ft / 39.37in
1cm = 0.39in
1mm = 0.04in
1kg = 2.20lb
1g = 0.04oz

Title-page photograph: A North Vietnamese T-54A punches through the gates of the Presidential Palace in Saigon, April 1975. Troops ride on the front of the tank, with some of their gear stored on the sides of the hull, a common PAVN practice. (Time Life Pictures/Vietnam National Archives/The LIFE Picture Collection/Getty Images)